



TRB

**Annual Report
1995**

Transportation Research Board

1920–1995

*Encouraging Research and Innovation in
Transportation for 75 years*

National Research Council

DEAR TRB SUPPORTER

Fiscal year 1995 has been a year of significant progress and substantial accomplishments for the Transportation Research Board. Sponsors, committee members, staff, and other TRB participants and supporters—all working together—deserve the credit for our success and should take pride in what they have achieved. Following are some of this year's highlights:

- ▲ Working in concert with the President's National Science and Technology Council, TRB conducted a forum on future directions in federal transportation research and development. This was an important outreach effort in a process to reassess priorities that we hope will be long term and bipartisan. Other major conferences during the year included a pair of concurrent conferences on intermodal transportation held in New Orleans; the latest in a series of international conferences on low-volume roads held in Minnesota; and the 1995 TRB Annual Meeting, which matched the attendance record set in 1994.
- ▲ The National Cooperative Highway Research Program marked a milestone with the issuance of its 200th synthesis of current highway practice. Over the years the NCHRP synthesis reports have proven to be among TRB's most popular and helpful services to the highway community.
- ▲ The Transit Cooperative Research Program, begun three years ago, is starting to hit its stride as the first batch of major research projects is being completed and the results published. One report, which addresses low-floor light rail vehicles, has already had an impact by influencing design and equipment selections for light rail systems.
- ▲ Another new program, Innovations Deserving Exploratory Analysis, which gives seed money to develop promising ideas in highway, transit, and intelligent transportation technology, has completed fourteen projects, at least three of which appear headed toward certain application.
- ▲ TRB issued a substantial update of the *Highway Capacity Manual*, and the Transportation Research Information Services bibliographic data base was released on CD-ROM.
- ▲ TRB completed both a policy study initiated by the Executive Committee on the relationship between highway capacity improvements and air quality and energy use; and another study requested by Congress that examined the market potential for a National Advanced Driving Simulator.
- ▲ The U.S. Department of Transportation's recently established Bureau of Transportation Statistics became a new TRB sponsor.

The past year has also been marked by significant debate over the scope and scale of federal programs. For transportation this means re-examining the federal role in funding, regulating, and operating the nation's multimodal transportation system, as well as re-evaluating how the federal government and its Department of Transportation can best

be organized to discharge their responsibilities effectively. We expect that the push for innovation in the transportation sector will be as strong as ever, perhaps stronger; however, one message is clear: the research community must aggressively seek more effective means to promote innovation and demonstrate the value of research.

At the Transportation Research Board, we have begun a major revision of our strategic plan. This effort involves an unprecedented level of customer outreach to TRB participants, supporters, and sponsors. Our aim is to determine how TRB can be more effective at fulfilling its core mission of advancing knowledge concerning the characteristics and performance of transportation systems, helping governmental or other agencies resolve specific issues related to transportation and transportation policy, and increasing the productivity and competence of the practicing transportation professional.

Change is nothing new at TRB, and this fact is especially evident as we reflect on our history during the year of TRB's 75th anniversary. The Board has demonstrated over the past 75 years that it can adapt and evolve to better serve its many constituencies. Our challenge for the future is to successfully continue this evolution. We welcome your thoughts and suggestions for meeting this challenge.



Lillian C. Borrone
Chairman



Robert E. Skinner, Jr.
Executive Director



**1995 TRB officers (from left):
James W. van Loben Sels, Vice Chairman;
Robert E. Skinner, Jr., Executive Director;
and Lillian C. Borrone, Chairman.**

TRANSPORTATION RESEARCH BOARD



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James W. van Loben Sels



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Sharon D. Banks



Brian J. L. Berry



Dwight M. Bower



John E. Breen



William F. Bundy



David Burwell



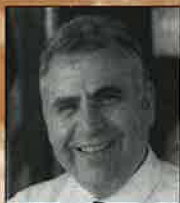
A. Ray Chamberlain



Ray W. Clough



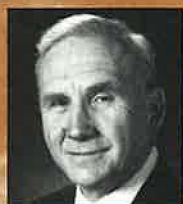
James C. DeLong



James N. Denn



Dennis J. Fitzgerald



James A. Hagen



Delon Hampton



Lester A. Hoel



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Robert Kochanowski



James L. Lammie



Charles P. O'Leary, Jr.



Jude W. P. Patin

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Executive Director: **Robert E. Skinner, Jr.**, Transportation Research Board

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Martin Wachs, Director, Institute of Transportation Studies, School of Public Policy and Social Research, University of California, Los Angeles

David N. Wormley, Dean of Engineering, Pennsylvania State University, University Park

Howard Yerusalim, Vice President, KCI Technologies, Inc., Mechanicsburg, Pennsylvania

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Francis B. Francois, Executive Director, American Association of State Highway and Transportation Officials, Washington, D.C. (ex officio)

Jack R. Gilstrap, Executive Vice President, American Public Transit Association, Washington, D.C. (ex officio)

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David R. Hinson, Administrator, Federal Aviation Administration, U.S. Department of Transportation (ex officio)

T. R. Lakshmanan, Director, Bureau of Transportation Statistics, U.S. Department of Transportation (ex officio)

Gordon J. Linton, Administrator, Federal Transit Administration, U.S. Department of Transportation (ex officio)

Ricardo Martinez, Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation (ex officio)

Jolene M. Molitoris, Administrator, Federal Railroad Administration, U.S. Department of Transportation (ex officio)

Dharmendra K. Sharma, Administrator, Research and Special Programs Administration, U.S. Department of Transportation (ex officio)

Rodney E. Slater, Administrator, Federal Highway Administration, U.S. Department of Transportation (ex officio)

Arthur E. Williams (Lt. General, U.S. Army), Chief of Engineers and Commander, U.S. Army Corps of Engineers (ex officio)



Craig E. Philip



Darrel Rensink



Joseph M. Sussman



Martin Wachs



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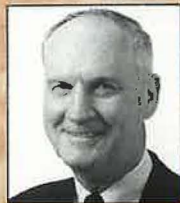
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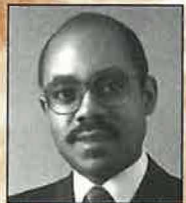
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Arthur E. Williams

TECHNICAL ACTIVITIES



Kathleen E. Stein-Hudson,
Chairman, Division
A Council

The Technical Activities Division of the Transportation Research Board (Division A) is responsible for standing committee and task force activities, the Annual Meeting, conferences and workshops, the field visit program, responses to inquiries in cooperation with the Library and Information Services, and publications. The staff is composed of specialists in each mode and discipline who work with the volunteer committees to carry out activities on behalf of TRB sponsors and the entire transportation community.

Standing Committees and Task Forces

The Division has 183 standing committees and task forces that involve more than 3,000 volunteers. The committees are organized into five groups: Group 1—Transportation Systems Planning and Administration; Group 2—Design and Construction of Transportation Facilities; Group 3—Operation, Safety, and Maintenance of Transportation Facilities; Group 4—Legal Resources; and Group 5—Intergroup Resources and Issues. The Division A Council provides a forum for interchange and interaction among the five groups and participates in TRB Executive Committee meetings. Kathleen E. Stein-Hudson chairs the Division A Council.



Robert E. Spicher,
Director, Technical
Activities

TRB and the transportation community are indebted to the volunteers serving on TRB committees, who give freely of their time and energy to promote research and disseminate current information through their various activities. The committees cover virtually all aspects of transportation. Several areas of new or special emphasis were added this past year:

- ▲ Transportation data and data systems (the Bureau of Transportation Statistics, U.S. Department of Transportation, has become a new sponsor of TRB),
- ▲ Strategic Highway Research Program product implementation,

- ▲ Linking civilian and military intermodal interests,
- ▲ Intermodal rail passenger service,
- ▲ Nonmotorized transportation, and
- ▲ Transportation funding.

New Committees and Task Forces (fiscal year 1995)

Ferry Transportation (A1B10)
Seismic Design of Bridges (A2C52)
Environmental Maintenance (A3C53)
Technology Transfer (A5012)

Disbanded Committees and Task Forces (fiscal year 1995)

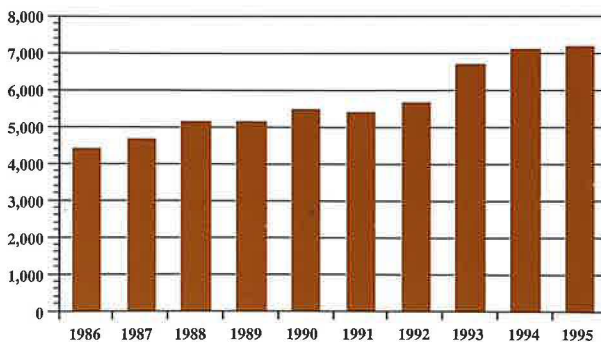
Travelers Services (A3B05)
Highway Research in Industry (A5T58)

1995 Annual Meeting

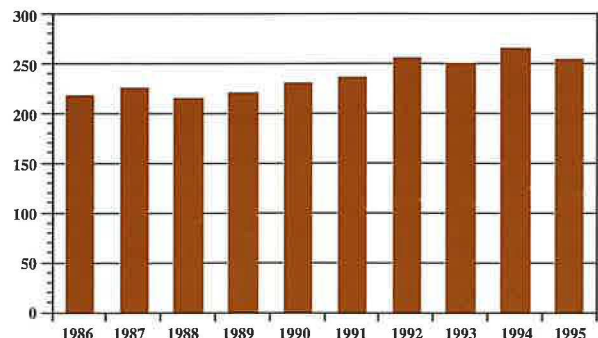
The 74th Annual Meeting was held January 22–28, 1995. Events were scheduled over seven days instead of the customary four to compensate for the unavailability of the Washington Hilton, one of the three hotels TRB uses for the meeting.

More than 1,400 presentations were given at 253 sessions, and more than 200 committee meetings were held. Of the 7,168 participants, 1,799 (25 percent) were attending for the first time. More than 700 participants came from countries outside the United States.

Among the highlights of the meeting was a session at which Secretary of Transportation Federico Peña and his staff presented U.S. DOT restructuring proposals. Other highlights included sessions on Federal Transit Administration programs, activities related to the Intermodal Surface Transportation Efficiency Act, and intermodal transportation. The Chairman's Luncheon speaker, John H. (Jack)



TRB ANNUAL MEETING ATTENDANCE



TRB ANNUAL MEETING SESSIONS



Division A Council (from left): James Bryden, New York State Department of Transportation; Thomas Humphrey, Massachusetts Institute of Technology; Michael Katona, U.S. Air Force Armstrong Laboratory; Kathleen Stein-Hudson, Howard/Stein-Hudson Associates; Richard Bower, California Department of Transportation; and Alan Pisarski, Falls Church, Virginia.

Gibbons, Assistant to the President for Science and Technology and Director of the White House Office of Science and Technology Policy, described the Clinton administration's interest in and commitment to a viable research and development program. The March–April 1995 issue of *TR News* includes complete coverage of the Annual Meeting.

Conferences and Workshops

TRB conducted 26 conferences and workshops in fiscal year 1995, including the Annual Meeting and the following (for complete listing, see page 35).

Intermodal Conferences

More than 550 people attended two concurrent conferences held in New Orleans in December 1994—Intermodalism: Making the Case—Making It Happen; and the Fifth TRB Conference on the Intermodal Freight Terminal of the Future. The first conference spotlighted intermodal innovations, especially practices that integrate ISTEA-related initiatives into the daily activities of public transportation agencies. The focus of the intermodal terminal conference was on terminal design, operation, and information technologies. The goal of the meeting was “to enhance the critical dialogue between a mature intermodal freight community and the public planners who are now developing intermodal practices in their operations.”

The conferences were sponsored by all five U.S. DOT modal administrations and the Office of Intermodalism and received support from the American Association of Port Authorities, the Intermodal Association of North America, and the American Trucking Associations. Proceedings of both conferences will be available from TRB in late 1995.

Forum on Future Directions in Transportation Research and Development

Approximately 170 representatives of the scientific and engineering community, the private sector, Congress, state and local governments, academia, and transportation stake holders participated in a two-day forum on the future role of federal research and development activities, held March 6–7, 1995, in Washington, D.C. The meeting was cosponsored by the White House Office of Science and Technology Policy and TRB. Joseph M. Sussman, JR East Professor and Professor of Civil and Environmental Engineering at the Massachusetts Institute of Technology, and past chairman of the TRB Executive Committee, chaired the TRB steering committee for the forum.

The meeting was prompted by the Clinton administration's concerns that current research and development (R&D) spending does not match the country's technological needs and opportunities. Breakout sessions were held in which individual constituency groups such as private industry, user groups, and others discussed their particular needs regarding federal R&D. One breakout session addressed the need for a framework for developing R&D priorities. Other sessions reviewed the specific topics covered in the Strategic Implementation Plan developed by the Committee on Transportation R&D of the President's National Science and Technology Council. The areas of emphasis include system assessment, planning, design, and management; physical infrastructure; information infrastructure—system operational control and management; and vehicles. The forum proceedings have been published as *Conference Proceedings 9: Forum on Future Directions in Transportation R&D*.

Juhani Tervala, Finnish Ministry of Transport and Communications, addresses Sixth International Conference on Low-Volume Roads held in Minnesota in June.



National Symposium on the Disadvantaged Business Enterprise Program in State and Federal Highway Contracting

TRB, the Federal Highway Administration, and the American Association of State Highway and Transportation Officials sponsored this symposium in Baltimore, Maryland, in March 1995. More than 170 individuals participated, including representatives from prime contractors, minority contractors, women contractors, state departments of transportation, and U.S. DOT. The symposium provided the participants with a forum in which to candidly discuss the administration of the Disadvantaged Business Enterprise program and to exchange views on the most effective ways to enhance the implementation and enforcement of the program.

Sixth International Conference on Low-Volume Roads

TRB conducted this conference in June 1995, hosted by the Center for Transportation Studies at the University of Minnesota. Conference attendance was 350, with one-fourth of the participants from countries outside the United States. Sixteen nations and twenty-five states were represented. Conference participants assessed planning, administration, management, physical and environmental aspects of low-volume roads, and technology transfer. Papers presented at the conference have been published in TRB *Conference Proceedings 6: Sixth International Conference on Low-Volume Roads, Volumes 1 and 2.*

Second National Symposium on Integrated Transportation Management Systems

Seattle, Washington, was the site for TRB's Second National Symposium on Integrated Transportation Management Systems. The symposium was held in cooperation with FHWA, the Washington State Department of Transportation, the City of Seattle, King County Metro, and the City of Bellevue. It was cosponsored by the Institute of Transportation Engineers Intelligent Transportation Systems (ITS) Council and various ITS America committees.

The symposium covered the key elements of ITMS, the benefits of ITMS, selected case studies, and current issues. The list of issues identified by the 194 participants will be used by TRB, ITS America, U.S. DOT, and other groups to help ensure that ITMS is developed and operated to maximize its benefits. Proceedings from the symposium will be available from TRB by the end of 1995.

International Conference on Nonmotorized Transportation

The TRB Task Force on Nonmotorized Transportation cosponsored the International NMT Symposium in Beijing, China. Seventy-four papers were presented. The symposium was attended by 175 delegates: 100 from China and 75 from 18 other countries.

Field Visits

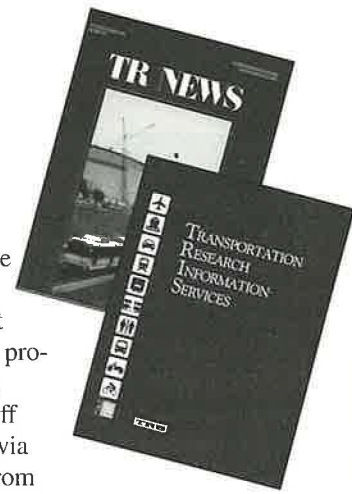
Each year Division A staff visit every state transportation department and selected universities, transit and other modal agencies, and industry organizations. The objectives of the field visit program are (a) to learn of problems facing the visited organization and to pass on information pertinent to the solution of these problems; (b) to learn of research activities in progress or contemplated to inform the visited organization of similar research being carried out elsewhere, thus preventing duplication of efforts; and (c) to identify new methods and procedures that might have application elsewhere. A summary of this year's visits can be found in the September–October 1995 issue of *TR News*.

Publications

TRB published 605 research papers in 44 volumes in the Transportation Research Record series this year. These papers were peer reviewed by members of TRB standing committees; typically about half of the papers submitted for publication are accepted. A CD-ROM containing these research papers will be distributed at the 1996 Annual Meeting. The Board published proceedings from four conferences. Nineteen Circulars were prepared containing research needs statements, workshop summaries, and other committee-generated information (see pages 28 and 29 for a complete listing).

Information Dissemination

All activities of the Division involve the dissemination of research information in one form or another (e.g., publications, conference discussions, Annual Meeting presentations, the field visit program). An equally important means of meeting the needs of transportation professionals for information on current findings, practices, and new technologies is through staff responses to direct inquiries. Many inquiries via telephone, fax, and letter are received daily from governmental agencies, researchers, and industry organizations and are answered by the Technical Activities staff in cooperation with the Transportation Research Information Services and Library staff. In addition, numerous meetings are held at TRB with visitors from all over the world.



Staff Changes

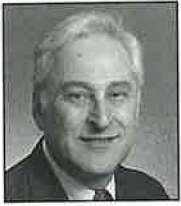
Kenneth Cook, TRB's transportation economist, retired after 29 years with TRB. Jon Williams, previously with the Metropolitan Washington Council of Governments, has joined the staff to cover the areas of economics, environment, finance, and administration.

Alice Watland has filled a new position created as a result of the Bureau of Transportation Statistics of the U.S. DOT joining TRB as a new sponsor. The new position focuses on expanding TRB's data-related activities.

Linda Karson, previously with the American College of Cardiology, is TRB's new Conference Manager, replacing Angelia Summons.



Luther Gerald Godfrey, FHWA, greets participant in National Symposium on Disadvantaged Business Enterprise Program in State and Federal Highway Contracting, held in Maryland in March.



Joseph M. Sussman,
*Chairman,
Subcommittee on
Planning and
Policy Review*

The Studies and Information Services Division (Division B) of the Transportation Research Board, under the direction of the Executive Committee Subcommittee on Planning and Policy Review, conducts policy studies at the request of Congress, executive branch agencies, states, and other sponsors; maintains and operates a computer-based research information service and extensive library; and produces syntheses of current practice in highway and transit operations.

Highlights of the Division's activities last year reveal notable achievements:

- ▲ Four major policy studies were released on the effects of highway expansion on clean air and energy, the nation's diverse highway research programs, railroad tank car safety, and research demand for a national driving simulator;
- ▲ The Transportation Research Information Services (TRIS) became available on CD-ROM and the number of computerized records increased to 360,000;
- ▲ The library responded to 7,000 reference questions from sponsors, affiliates, and staff; and
- ▲ A record number of highway and transit syntheses of practice were produced for highway and transit agency sponsors.



Stephen R. Godwin,
*Director, Studies
and Information
Services*

Subcommittee on Planning and Policy Review

The Executive Committee of TRB originally established the Subcommittee on Planning and Policy Review (SPPR) to oversee policy studies and other activities of the Studies and Information Services Division. The SPPR is chaired by Joseph M. Sussman, JR East Professor and Professor of Civil and Environmental Engineering, Massachusetts Institute of Technology. The membership is drawn from transportation leaders in all modes and the public and private sectors. In addition to overseeing TRB's policy studies, the SPPR has a number of duties, including periodically reviewing major transportation issues and advising the Executive Committee about possible TRB responses, and acting on the Executive Committee's behalf on matters that require attention between Executive Committee meetings.

Policy Studies

The Policy Studies group continues to serve as a neutral forum for addressing complex, controversial transportation policy issues. Balanced expert committees, whose members serve without compensation, completed four major projects, two of which were conducted at the request of Congress. Work continued on three other projects begun in previous years, and three new projects were initiated during the year. Subjects span all modes, with an emphasis on environmental and safety issues.

Completed Projects

Impacts of Highway Capacity Improvements on Air Quality and Energy Use

To meet the regulatory requirements of the Clean Air Act Amendments of 1990, state and local planners are being asked to make judgments about the likely effects of highway capacity additions on air quality. The issue is already a target of litigation that threatens to stall metropolitan highway construction programs. The Executive Committee of TRB initiated this study to evaluate the current state of knowledge about the impacts of expanding highway capacity on traffic flow characteristics, travel demand, land use, vehicle emissions, air quality, and energy use in metropolitan areas. Funding was provided by the Federal Highway Administration, the American Association of State Highway and Transportation Officials, the Environmental Protection Agency, and by unrestricted grants to TRB's Institute for Strategic Transportation Studies from the UPS Foundation, the Association of American Railroads, CONRAIL, Inc., and Norfolk Southern Corporation.

Under the chairmanship of Paul E. Peterson, Henry Lee Shattuck Professor of Government at Harvard University, the study committee (with the exception of one member) concluded that currently available analytic methods are inadequate for meeting regulatory requirements. For example, emissions models cannot reliably predict changes in emissions levels from traffic flow adjustments resulting from expanded highway facilities. Furthermore, generalizations about the effects of highway capacity additions on air quality and energy use are inappropriate, because the effects

depend greatly on local conditions—type of capacity addition, location of the project in the region, extent and duration of preexisting congestion, prevailing atmospheric and topographic conditions, and development potential of the area.

In the committee's opinion, the current regulatory emphasis on curbing motor vehicle travel by limiting highway expansion is likely to have small effects on metropolitan air quality by attainment deadlines. More productive approaches for meeting air quality goals include further technological advances in vehicles and fuels and pricing motor vehicle travel more directly. These findings are described in detail in TRB *Special Report 245: Expanding Metropolitan Highways—Implications for Air Quality and Energy Use*.

Highway Research: Current Programs and Future Directions

At the request of FHWA and AASHTO, TRB created the Research and Technology Coordinating Committee to review federally funded highway research activities and to provide an independent assessment of research opportunities and priority recommendations from which FHWA can draw in developing its research program. The RTCC, which includes the perspectives of states, university researchers, and private industry, was chaired by H. Norman Abramson, retired Executive Vice President of Southwest Research Institute, through mid-1995. Raymond F. Decker, President of University Science Partners, is the current chairman. The RTCC is funded by FHWA.

In TRB *Special Report 244: Highway Research—Current Programs and Future Directions*, the first major report of the RTCC, the committee noted that highway research and technology (R&T) activities, like the highway industry itself, are

highly decentralized in the United States. Several federal agencies, each state highway agency, private companies, universities, and various public and private groups sponsor or conduct highway R&T programs. No single source of information about highway R&T ties together the various programs and activities in a manner that would be useful to top-level decision makers in the public and private sectors. This report fills that gap. It describes the three principal public-sector highway R&T programs: the FHWA program, the State Planning and Research program, and the National Cooperative Highway Research Program. It also explains how these programs are financed and managed and shows how each serves different needs by focusing on different topics.

The committee found that current highway R&T programs have established a solid foundation for future development and are most effective when focusing on efforts to reduce costs and improve performance for a broad range of transportation technologies, from asphalt pavement to traffic signal systems. The committee also concluded that areas of highway research with potentially large payoffs should receive increased program funding and that the future highway R&T program should also have a broader perspective than in the past, encompassing the interactions among highways, other transportation modes, and nontransportation societal objectives as well as other factors—such as maturing telecommunications technologies—that affect many aspects of transportation.

Ensuring Railroad Tank Car Safety

The design and safety of about 115,000 railroad tank cars in the United States are regulated by the U.S. Department of Transportation because they are used to carry hazardous liquids and gases.



PENNDOT

TRB's Committee for a Study on Transportation and a Sustainable Environment is examining how to modify U.S. transportation system needs in future decades to be more compatible with environmental goals.

These tank cars, which make about 1 million trips each year, experience about 1,000 accidental releases annually. Most are small spills and leaks caused by defective or poorly secured valves and other tank components. Yet serious incidents still occur. Although no one has died in a tank car accident since 1980, several such accidents have led to injuries, communitywide evacuations, environmental damage, and other severe consequences.

Concerned about whether the tank car design process was adequate to protect public safety, Congress called for a study of this process in the 1990 Hazardous Materials Transportation Uniform Safety Act. To conduct the study, TRB convened a committee of experts under the chairmanship of Herbert H. Richardson, Director of the Texas Transportation Institute, Texas A&M University System. The Federal Railroad Administration sponsored the study.

In TRB *Special Report 243: Ensuring Railroad Tank Car Safety*, the committee concluded that trends in tank car safety are encouraging. Major incidents continue to be rare, and there are no indications this trend will reverse. The system for ensuring tank car safety, consisting of government and industry standard-setting, research, and enforcement, is fundamentally sound. Despite these accomplishments, the system must be capable of meeting new and changing safety demands. To better meet these demands, the committee recommended several modifications to the tank car safety process, including improvements in the way U.S. DOT and industry plan and implement design improvements and the types of criteria used for predicting the safety performance of individual tank car design types.

Estimating Demand for the National Advanced Driving Simulator

Driving simulators have been used for many years to examine human factors and operator performance, for driver training and certification, and for product development. Simulators span a range from very simple desktop devices to highly sophisticated advanced driving simulators. The advanced simulators have an extensive motion base and state-of-the-art computer-generated visual displays designed to provide the user with a realistic driving experience. Such devices could be useful in conducting vital safety research without placing operators at risk. There are, however, very few advanced driving simulators in the world and none at present in the United States.

For some years the National Highway Traffic Safety Administration has been developing plans to build a National Advanced Driving Simulator (NADS). After a nationwide competition, NHTSA selected the University of Iowa as the site for NADS. This simulator is estimated to cost approximately \$32 million to build, roughly two-thirds of which would be paid by the federal government. There has been ongoing controversy about this project, because of questions about whether demand would be adequate to cover the operating cost and because of the lack of private-sector willingness to share in the capital cost.

In late 1994 Congress asked TRB to assess the capacity and demand for NADS. To conduct the study, TRB convened a committee chaired by Aaron Cohen, Zachry Professor of Engineering at Texas A&M University. NHTSA sponsored the study, which was conducted in seven months and delivered to Congress on June 1, 1995.

The committee was asked to determine whether "it is highly likely that NADS will be used to 80 percent of capacity. . . provided that no more than 50 percent of capacity usage is attributed to NHTSA." The committee, with a single exception, decided that NADS was likely to be used to this extent. The dissenting committee member was unconvinced that this demand would be realized and believed that the research need for such a device had not been established. In its report, *Estimating Demand for the National Advanced Driving Simulator*, the committee noted that future use of NADS will come from a variety of sources, predominantly federal agencies. Thus, the committee's affirmation about use of NADS depends on future levels of funding for research and development from agencies such as the Departments of Transportation, Defense, and Health and Human Services.

Ongoing Projects

During the past year, TRB committees continued work on three projects.

Research and Technology Coordinating Committee

Under the sponsorship of FHWA and in cooperation with AASHTO, TRB formed this committee to provide continuing assessments of the nation's highway research program. During the past year the committee completed an overview of current highway research in the United States, described earlier. The committee is currently completing a white paper on highway transportation and



The full costs and subsidies for surface freight transportation are being examined by a TRB study committee chaired by José A. Gomez-Ibañez, Harvard University.



environmental research related to air quality. It recently began an examination of the long-term impacts of highway transportation on society (and vice versa) with a view toward identifying specific research gaps that FHWA could address.

Study of Public Policy for Surface Freight Transportation

Chaired by José A. Gomez-Ibañez, Professor of Public Policy and Urban Planning at Harvard University, this committee is examining the external costs and subsidies in surface freight transportation. External costs are those borne involuntarily by others instead of by shippers and carriers. Subsidies occur if shippers and carriers do not fully reimburse the cost of government-provided infrastructure or services. The presence of external costs and subsidies can prevent freight markets from efficiently meeting the service requirements of the U.S. economy.

The study is preliminary, aimed at determining the feasibility of developing a base of information that would help government set policies on taxation, investment, and regulation that promote efficient freight movements. Funded by U.S. DOT and the state departments of transportation through NCHRP, the project will be completed in 1995.

Transportation and a Sustainable Environment

The interest in transportation's role in sustainability reflects the growing recognition that whereas transportation is an essential component of modern economies, the long-term resource use and environmental impacts of transportation appear incompatible with scientific and popular notions of a healthy global environment. Although

individuals disagree about what sustainability means when applied to transportation, a major transportation issue facing the world community is how to strike a balance between mobility and access needs on the one hand (which strongly affect economic development and lifestyle) and environmental and resource imperatives on the other (which affect the health of the ecosystem and human beings).

The study committee overseeing this project is made up of experts in environmental sciences, public policy, and transportation. Dr. James D. Ebert, Professor of Biology, Johns Hopkins University and President, Marine Biological Laboratory, serves as chairman. The committee is examining whether and how the U.S. transportation system needs to be modified in future decades to achieve a sustainable environment. The study will be completed by the end of 1996. Funding is being provided by FHWA, the Federal Transit Administration, AASHTO (through NCHRP), the Transit Development Corporation (through the Transit Cooperative Research Program), the Energy Foundation, the U.S. Department of Energy, and through unrestricted grants to the Institute for Strategic Transportation Studies made by the UPS Foundation, the Association of American Railroads, Norfolk Southern Corporation, and CONRAIL, Inc.

New Projects

TRB began three new studies during 1995.

Consumer Automotive Safety Information

At the request of Congress, and with funding from NHTSA, TRB formed a study committee chaired by Dr. M. Granger Morgan, Head of the Department of Engineering and Public Policy at

Carnegie Mellon University, to examine motor vehicle safety consumer information needs and the most cost-effective methods of communicating this information. The committee met twice during the year and held a workshop to solicit a broad range of views on consumer automotive safety information needs and communication methods. The study will be completed in time to meet a congressionally mandated deadline of March 31, 1996, when the report must be submitted to the House and Senate Committees on Appropriation.

Approaches for Increasing Private Sector Involvement in the Highway Innovation Process

Providing highway transportation in the United States is a joint public and private enterprise. Despite their mutual dependence, however, public and private organizations do not have a strong tradition of cooperation or partnership in the search for and implementation of innovations that improve the quality, delivery, and efficiency of highway services. During the past decade public spending on highway research has increased significantly, yet highway agency officials recognize that public sector research and development activities cannot meet the many growing and changing needs of the highway system and its users. Many highway officials would like to tap into the vast potential for innovation that the private sector can provide if given the right incentives and encouragement. In recognition of this need, FHWA, AASHTO, and several highway industry associations and companies have funded a special TRB study committee to explore approaches for increasing private sector involvement in the highway innovation process. One of the ideas being explored is a proposed highway

industry strategic council that would meet regularly to advance measures critical to encouraging innovation. The committee, which is being chaired by Lowell Jackson, retired Vice President for Transportation, Greenhorne & O'Mara, Inc., is scheduled to release its final report in early 1996.

Review of the Highway Cost Allocation Study

The Federal Highway Act of 1956 declared that the tax burden among the various classes of persons using the federal-aid highways should be distributed equitably, and required a study with the objective of assigning responsibility for federal highway costs to specific classes of users and guiding Congress in setting user taxes. The study that resulted from that request, and subsequent studies conducted by FHWA, are referred to as "cost allocation" studies. Many states have imitated the federal studies to provide a basis for state highway user taxes. FHWA has embarked on a new cost allocation study, to be completed in 1997.

FHWA has asked TRB to assist in its study by convening a committee of civil engineers; administrators of government transportation agencies; and economists with expertise in public finance, external costs, and transportation. The committee is chaired by David J. Forkenbrock, Professor of Urban Planning and Civil Engineering and Director of the Public Policy Center at the University of Iowa. FHWA will present study plans, problems, and preliminary results to the committee for review and comment. The committee will communicate its evaluations and recommendations to FHWA in a series of brief letter reports.

The impacts of metropolitan highway expansion were evaluated by the TRB Committee for a Study of the Impacts of Highway Capacity Improvements on Air Quality and Energy Consumption.



Information Services

Transportation Information Research Services

TRB maintains and operates Transportation Information Research Services, a unique on-line computerized information file that contains both abstracts of completed research and profiles of research in progress. The TRIS mission is to acquire, provide access to, and disseminate reference materials for all transportation research projects and publications useful to administrators, engineers, operators, researchers, and other members of the transportation community.

This comprehensive transportation research information system grew during the past year by the addition of nearly 10,000 new entries. There is currently a total of approximately 360,000 records in the data base. The information is collected from several sources, including review, abstracting, indexing, and keyboarding of transportation journals, proceedings, technical reports and other literature; magnetic tape records received from participating U.S. transportation libraries and the International Road Research Documentation program of the Organization for Economic Cooperation and Development countries; and machine-readable records of U.S. highway and transit research in progress received from federal and state agencies.

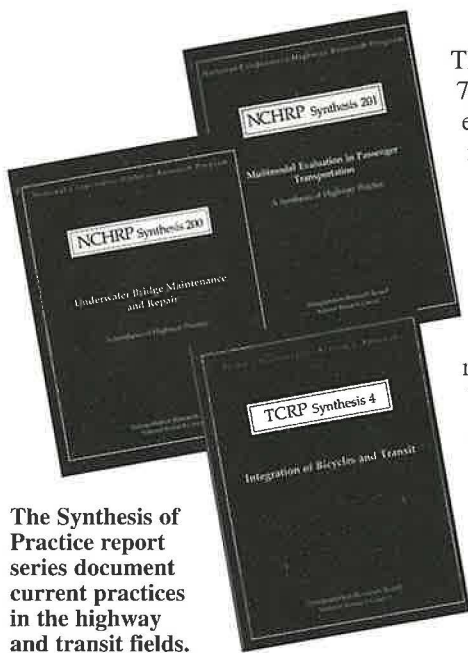
In January 1995 TRIS became available as part of the TRANSPORT CD-ROM, available from SilverPlatter Information Service, Inc. The product is the result of a contract between the OECD and SilverPlatter. TRANSPORT contains the TRANSDOC data base, produced by the European Conference of Ministers of Transport, IRRD, and TRIS. This package includes an archive disk containing records from 1968 to 1988 for all three data bases, plus a current disk containing records from 1988 to the present. Subscribers to TRANSPORT receive four quarterly updates of the Current Disk, search and retrieval software, and toll-free hotline service. The disks may be mounted on a single-user workstation, a local-area network, or a wide-area network. Internet users subscribe and receive updated information via SilverPlatter's proprietary Electronic Resource Library in place of disks. The TRIS data base can also be searched on line through DIALOG Information Services, Inc., of Palo Alto, California, a service of Knight-Ridder Information Services, Inc.

For those without access to TRANSPORT or DIALOG, TRIS provides an inquiry service to TRB sponsors at no charge, and to TRB members and the public for a fee of \$100 (TRB members receive a 25 percent discount). On request, TRB staff search TRIS to identify abstracts and citations. The subjects of Inquiry Service responses that appear to have broad interest are designated as Hot Topics and these search results are mailed to state and other transportation librarians each month. They are also posted monthly on FHWA's Electronic Bulletin Board System. There are currently more than 650 topical bibliographies publicly available without charge through FEBBS. In the past year FEBBS has become available via Internet and by calling a toll-free number. These additional means of access have significantly increased the number of TRIS Hot Topics downloaded from FEBBS each month from a 1993 average of 35.3 to a 1994 average of 62.9.

Improvements in the collection of information on SP&R projects are under way. In November 1994 FHWA and TRB entered into a cooperative agreement, Integrated Transportation Research Information Systems. The goal of this agreement is to allow state DOTs to enter project descriptions directly into TRIS via an on-line connection, using the AASHTO Value Added Network for communications. Deployment of computers and establishment of on-line connections began in 1995.

Library

The TRB library serves the information needs of TRB sponsors, affiliates, and staff. The library currently houses more than 20,000 books, reports, and microfiche records, including a complete collection of all TRB and Strategic Highway Research Program publications. The library has a small but growing audiovisual collection including the audio tapes from the past two TRB annual meetings and videos produced by NCHRP and SHRP, and a small collection of transportation-related videos. The library receives about 380 journals. Library staff have access to hundreds of on-line data bases and electronic resources through Knight-Ridder's Dialog Information Systems, Online Computer Library Catalogue, CD-ROMs, and the Internet. The use of a variety of electronic sources to respond to information requests is enhancing the library's ability to serve its users.



The Synthesis of Practice report series document current practices in the highway and transit fields.

The library responds to about 7,000 reference questions each year. Requests are received from state DOTs, U.S. DOT, TRB sponsors, and the transportation research community.

Because many government agencies and private organizations continue to reduce their own library budgets and depend more heavily on TRB for information, the Library Affiliate Program was established to provide service to these organizations. For a small annual fee, TRB Library

Affiliates receive the full

array of TRB library reference services and are offered a 25 percent discount on TRIS inquiry services, single copies of TRB publications, and photocopies, in addition to other benefits.

The library continues to be involved in transportation information issues. This year library staff worked with representatives from FHWA, AASHTO, and the Transportation Division of the Special Libraries Associations to sponsor a conference on international transportation information resources March 19–21, 1995, in Washington, D.C.

Synthesis of Practice Reports

Under the sponsorship of the Cooperative Research Programs administered by TRB, the Synthesis Unit prepares reports on current practices in the highway and transit fields. These reports have proven to be among TRB's most popular products, serving as an effective means of assembling and disseminating information on the state

of the practice. The reports are prepared under the guidance of a topic panel, usually with the assistance of an expert in the topic area who serves as the project consultant. Topics are selected and studies are overseen by experts from highway and transit agencies.

This was a benchmark year. The printing of 20 highway synthesis reports for NCHRP doubled the output of the previous year. These reports addressed many of the most important issues facing state highway departments, including effective maintenance techniques, recycling of waste materials, tort liability, corridor preservation, metropolitan planning, and strategies to manage congestion. One highway synthesis project, Underwater Bridge Maintenance and Repair, was cited for the Outstanding Accomplishment Award by the National Capital Chapter of the American Concrete Institute. Another 33 highway syntheses are in development.

In addition to the highway synthesis publications, seven transit synthesis studies were published under TCRP. The topics include management information systems, retrofit of buses to meet clean air standards, waste control practices, bus route evaluation, and system-specific spare ratios. *TCRP Synthesis 8: Retrofit of Buses to Meet Clean Air Regulations* was published in time for transit agencies to use as guidance in meeting federal requirements under the Clean Air Act, and several training courses have evolved from the synthesis. In addition to the 7 reports published during the year, another 11 transit syntheses are in various stages of production.

In addition to completing a record number of reports, the Synthesis Unit made extensive efforts to streamline procedures and improve the timeliness of document publication. It is anticipated that these new procedures will be welcomed by topic panel members, as well as by the sponsors of the NCHRP and TCRP Synthesis programs.

COOPERATIVE RESEARCH PROGRAMS

Through its Cooperative Research Programs (Division D), the Transportation Research Board administers two programs: the long-standing National Cooperative Highway Research Program, sponsored by the American Association of State Highway and Transportation Officials; and the newly created Transit Cooperative Research Program, sponsored by the Federal Transit Administration. 1995 has been a year of consolidation for the programs, following three years of change after the Intermodal Surface Transportation Efficiency Act was enacted in 1991. ISTEA created TCRP and significantly increased the funding for NCHRP. As of June 30, 1995, staff for both programs numbered 32.

National Cooperative Highway Research Program

The National Cooperative Highway Research Program is a unique, applied-research program designed to respond to the needs of state highway and transportation departments by solving pressing operational problems in highway transportation. Although NCHRP accounts for a small percentage of the nation's annual investment in highway research, its close association with AASHTO and its position within the National Research Council have enabled it to carry out much research that has resulted in practical products for AASHTO and others.

NCHRP has been sponsored by AASHTO since 1962, in cooperation with the Federal Highway Administration. Over its lifetime the program has administered 645 research projects totaling more than \$154 million, produced 955 reports, and led to the development of 605 publications in the NCHRP Report and NCHRP Synthesis of Highway Practice series. Projects in the fiscal year 1995 program were placed under contract as funds became available during early 1995.

Proposal solicitations for 20 fiscal year 1996 research projects were released in August and September 1995, and contracts will be executed in the first three months of 1996. Activities leading to the formulation of the fiscal year 1997 program were initiated by AASHTO in February 1995 with program content to be determined by AASHTO in March 1996.

ISTEA authorized an increase in funds under the State Planning and Research provision, formerly Highway Planning and Research. The result has been a proportional increase in NCHRP funding; more than \$17 million annually has been available

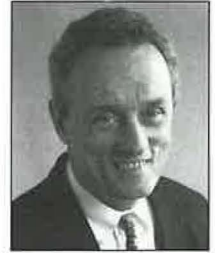
to the program through federal fiscal year 1995. However, reductions are expected for fiscal years 1996 and 1997, because the amount of SP&R funds will be less. Although the number of NCHRP research problems selected by AASHTO for fiscal year 1996 are lower than in the last three years, the program's ability to respond to the collective need of a large number of high-priority research problems has not been affected.

After an initial round of reviews, 165 research problems were submitted to AASHTO for possible inclusion in the fiscal year 1996 program. Twenty-seven states and twelve AASHTO committees submitted problems. The quantity and quality of submissions ensure that the funds available under ISTEA will be well used.

Forty NCHRP publications were produced during 1995. A total of 117 projects were under contract during 1995 and, as of June 30, an additional 33 projects are under development or awaiting contract.

Each NCHRP study is conducted according to an approved research plan under the guidance of an advisory panel, which is composed of technical specialists and experienced practitioners. The use of advisory panels helps to produce research findings with the credibility needed for adoption by AASHTO, state transportation departments, and other organizations. There are many examples of NCHRP research projects that have had a direct impact on transportation practice through products such as specifications, manuals, and guidelines. NCHRP places a special emphasis on working with practitioners who are expected to use the research results. NCHRP's most important asset in meeting this goal is its close relationship with AASHTO committees. Experience indicates that AASHTO committees are more likely to use research results if (a) the committee identifies and requests the needed research in the first place, (b) members of the committee serve on the advisory panel that guides the study, and (c) the findings and recommendations are presented to the committee at the conclusion of the study. NCHRP projects frequently include these three steps.

Many NCHRP projects are requested by AASHTO committees to recommend revisions to existing AASHTO publications. When a NCHRP project produces recommendations that are adopted by AASHTO as a guide or specification, it ensures that practitioners, who might not have the time to stay abreast of all research results in their areas of interest, will benefit from the best information available by using the AASHTO documents.



Robert J. Reilly,
*Director,
Cooperative
Research Programs*



Transit ridership increase issues are focus of attention for TCRP Project H-5.

Full details on the program's work since 1962 can be found in *NCHRP Summary of Progress Through 1988* and *NCHRP Summary of Progress, December 31, 1994*. Highlights of recent activities include the following:

- ▲ In fiscal year 1995, 106 NCHRP project panel meetings were held. Panel members contributed more than 2,100 days of volunteer time attending meetings and at least an equal amount of time reviewing materials at their own work sites. NCHRP benefits from a group of more than 1,110 volunteers who are willing to devote time and energy to such efforts, primarily because of the satisfaction received from making significant contributions in their field.
- ▲ In November and December 1995 contractors were selected to conduct 20 new NCHRP projects. Over the past few years, an average of seven proposals were received for each project.

In addition to these recent activities a number of NCHRP studies particularly important to AASHTO were either initiated or completed during the past year:

- ▲ *Multimodal Transportation Planning.* ISTEA requires states and metropolitan areas to develop transportation plans and programs that consider all modes of surface transportation to move people and goods efficiently. AASHTO's Standing Committee on Research

allocated \$1.655 million for a series of five research projects on the basis of recommendations from an NCHRP workshop held in late 1993. These projects were initiated in 1995: (a) Innovative Practices for Multimodal Transportation Planning for Freight and Passengers, (b) Multimodal Transportation: Development of a Performance-Based Planning Process, (c) Integration of Land Use Planning with Multimodal Transportation Planning, (d) Developing and Maintaining Partnerships for Multimodal Planning, and (e) Multimodal Transportation Planning Data. In late 1995 NCHRP will reassess and set priorities for other suggested research topics developed at the workshop.

- ▲ *Highway Safety.* Project 17-13 was initiated to develop a strategic plan for improving roadside safety. Great strides have been made in highway safety during the past 30 years, but roadside crashes still produce 40 percent of current highway fatalities. This safety problem may be more difficult to address than others faced in the past, particularly with a more diverse vehicle fleet, an increasing population of older drivers, and a decline in motorist compliance with traffic regulations. The findings of the panel for this study will serve as the basis for a national conference on the subject.

Robert J. Reilly delivers orientation address to new NCHRP panelists in Washington, D.C., in December 1994.



- ▲ *Older Drivers.* Under NCHRP Project 3-44, improvements to traffic control devices that could aid older driver performance were field-tested in mid-1995. FHWA is expected to include the results of this project in its *Handbook for Accommodating Older Drivers*.
- ▲ *Economics.* The MicroBENCOST software package, developed in NCHRP Project 7-12 for the analysis of highway user costs, has been rigorously tested and is now available through the McTrans Center at the University of Florida. The requirements of ISTEA generated considerable interest in this planning tool. Independent testing efforts in Canada led to the adoption of this software as a Canadian national standard.
- ▲ *Plan for SHRP Follow-Up Studies.* The objective of Project 20-35 was to identify and set priorities for SHRP follow-up research in highway operations, concrete and structures, and asphalt. Research needs were identified at a workshop held in June 1994 and attended by approximately 50 individuals from various sectors of the highway community. From the prospective research projects identified at this conference, three projects were selected for NCHRP research.
- ▲ *Metric Conversion.* AASHTO member departments are preparing to meet federal mandates to work in the metric system by October 1, 1996. NCHRP Projects 20-7, Task 61, Assessment of AASHTO Needs for Metric Conversions, and 20-40, Conversion of AASHTO Publications to Metric Units, are intended to assist AASHTO with this effort. Project 20-7, Task 61 included an assessment of the number of AASHTO documents requiring conversion to the metric system and the operation of a pilot "metrication clearinghouse," being conducted at the Texas Transportation Institute. Project 20-40, which started in late 1994, is charged with the metrication of approximately 25 AASHTO documents.
- ▲ *Bridge Management.* Under NCHRP Project 12-28(2)A, Bridge Management Systems Software, the BRIDGIT computer program has been developed. BRIDGIT is based on a bottom-up approach to bridge management that allows recommendations to be made for the management of an entire network of bridges or for a single bridge. Version 1.0 of BRIDGIT was released in April 1995 to the state DOTs and is available to others on request. Additional enhancements are under way.
- ▲ *Highway Capacity Manual.* In January 1995 the third edition of TRB *Special Report 209: Highway Capacity Manual*, was released. The latest version of the TRB's most popular publication includes the results of several NCHRP research projects. The three major new components are: (a) Project 3-28C, Effects of Quality of Traffic Signal Progression on Delay; (b) Project 3-33, Capacity and Level-of-Service Procedures for Multilane Rural and Suburban Highways; and (c) Project 3-37, Capacity and Level of Service at Ramp-Freeway Junctions.
- ▲ *Strategic Direction for NCHRP.* During its 33-year history NCHRP, although it has evolved in its technical content and procedures, has varied little from its original design. Faced with a new environment and an expanded budget for the program, in 1995 the AASHTO Standing Committee on Research decided to assess the NCHRP and AASHTO's other research activities and to develop a strategy for the future. NCHRP Project 20-37 was initiated with this objective in March 1993. The final report was presented to SCOR in March 1995. A major initiative to enhance the implementation of research was approved. Other findings from the report will help guide staff in the administration of NCHRP.
- ▲ *Environmental Research.* A significant amount of NCHRP resources continues to go toward addressing environmental issues affecting wetlands, water quality, the use of waste and recycled material in construction, and particularly air quality, a field in which approximately \$5.5 million in research is either programmed or under way to study vehicle emissions, the implementation and effect of transportation control measures, and the modeling of carbon monoxide impacts.

Transit Cooperative Research Program

TCRP was authorized by ISTEA and initiated under TRB management in July 1992. TCRP is supported by annual grants from FTA, and research for the program is selected by the TCRP Oversight and Project Selection (TOPS) Committee, which is also the Board of Directors of the Transit Development Corporation, a nonprofit educational and research affiliate of the American Public Transit Association. A memorandum of agreement among FTA, APTA, and TRB outlines the program's operating procedures.

TCRP's fiscal 1992 grant was \$8.92 million; the grant for 1993 was \$7.75 million; and the grants for 1994 and 1995 were each \$8.75 million. In the first three years of TCRP's existence, 140 studies were authorized. As of June 30, 1995, 31 studies were completed and 109 were in progress.

Anyone may submit a research problem statement to TCRP at any time. In its first 3 years more than 750 problem statements were considered for the program. In 1995, TCRP issued a call for problem statements to more than 1,300 individuals and organizations throughout the transit community. The solicitation emphasized the need for research that is consistent with the FTA Strategic Plan and the TCRP Strategic Plan. TRB has received and processed 155 problem statements for the fiscal year 1996 program. The TCRP staff, with the aid of APTA, has made a concerted effort to improve the dissemination of information about the program and the opportunities it provides to suggest research topics.

Under the terms of the grant, TCRP submits quarterly progress reports to FTA. They describe the work accomplished during the quarter and the work anticipated for the next period. Full details of the program's progress since its initiation can be found in the latest TCRP Annual Report. Highlights of activities during the reporting period include the following:

- ▲ Seventy-seven TCRP panel meetings were held during 1995, involving more than 750 transit professionals and representing more than 15,000 volunteer hours. This included 31 panel meetings to prepare research problem statements and select research agencies, and 20 interim-report review meetings, in which panels met with the research agencies to assess midcourse progress. Twenty-six meetings were held for Transit Synthesis studies and other TCRP Special Projects.
- ▲ Sixteen research agencies were selected during the year for TCRP projects. The first 52 TCRP research projects received 393 proposals, an average of 8.3 per project. The 393 proposals came from 237 sources, 56 percent of which had never proposed on an NCHRP project and 70 percent of which had never been under contract to NCHRP.
- ▲ Three research reports and twelve syntheses have been published since the inception of the program. Seven *Research Results Digests* and four *Legal Research Digests* have been published. As of June 30, 1995, eight additional research projects have been completed and are in the editing and publication process.

TOPS committee meeting (from left):
William Millar, Port Authority of Allegheny County;
Frank J. Cihak, American Public Transit Association;
Robert E. Skinner, Jr., Executive Director, TRB;
Sharon Banks, AC Transit.



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- ▲ TCRP completed a strategic plan for 1996 and 1997 that stresses four strategic priorities: (a) place the customer first, (b) improve transit productivity, (c) make ISTEA work, and (d) streamline transit organizations. Fourteen objectives support these priorities. The plan will be used to aid in selecting the TCRP research program for the next two years.

The following TCRP activities of particular interest to the transit community were completed during 1995:

- ▲ *Research Dissemination.* Dissemination of research results has been a TCRP priority since its inception. APTA, the research agency for Project J-1, Dissemination and Implementation of Research Findings, has completed a comprehensive plan for TCRP research dissemination that includes a variety of techniques to help reach the transit community. In conjunction with TCRP staff, APTA will review TCRP products quarterly and select some for special treatments such as videotape production, special presentations at conferences, entries on an Internet home page, and articles in trade journals. APTA has distributed approximately 15,000 copies of TCRP publications to the transit industry.
- ▲ *Identification of Research Needs To Increase U.S. Transit Ridership.* More than 50 transit-industry professionals attended a TCRP Project H-5 workshop in November 1994 to develop research topics on this theme. During two days of intense, small-group

workshops, thirty-one research topics were identified, and the TOPS Committee subsequently selected three of them for the FY 1995 program: B-9, Market Segmentation Strategies To Increase Transit Ridership; B-10, Role of Passenger Amenities and Transit Vehicle Characteristics in Building Ridership; and B-11, Customer-Defined Service Quality. *Research Results Digest 6* reports the problem statements that were identified but not selected by TOPS for TCRP funding. These problem statements are available for other researchers.

- ▲ *Rural Transit.* Two projects of interest to the rural transit community were completed in 1995: Project A-2, Service Delivery Systems for Rural Passenger Transportation, and Project B-3, Demand Forecasting For Rural Public Transportation. The A-2 guidebook and accompanying personal computer software are available to assist rural transit operators in planning services. The B-3 *Workbook for Estimating Demand for Rural Passenger Transportation* and accompanying software are also available for aiding in preparing ridership estimates for new rural transit services.
- ▲ *Low-Floor Light Rail Vehicles (LRVs).* *TCRP Report 2: The Applicability of Low-Floor Light Rail Vehicles in North America*, was published in June 1995. There is great interest in this new LRV technology in the United States and Canada, because low-floor LRVs improve accessibility for the disabled and reduce boarding times for all passengers. European transit systems have considerable



Screening panels meet once a year to recommend research problems for consideration by TCRP Oversight and Project Selection Committee.

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ISTEA requires state DOTs to establish public transportation management systems by October 1996.

experience with low-floor LRVs of several different designs, but most North American transit agencies have hesitated to make the change because of uncertainty about cost and performance. The findings of this project indicate that there are no significant operational or maintenance problems with low-floor LRVs, and significant savings in construction costs of access facilities for the disabled may be realized for new light rail lines. Partly as a result of this project one transit agency has decided to use low-floor LRVs, estimating construction-cost savings of approximately \$20 million as a result.

- ▲ *Reduced Visual Impacts of Overhead Electric Contact Wire.* The Greater Cleveland Regional Transit Authority anticipates using the results of TCRP Project D-4, Visual Impact of Overhead Contact Systems for Electric Vehicles, in planning a light rail extension. The findings of this project are particularly significant because citizen opposition to overhead wire is one of the primary obstacles to public acceptance of light rail or electric trolley bus systems. The report will be published in autumn 1995.
- ▲ *Public Transportation Facilities and Equipment Management Systems.* ISTEA required state DOTs to establish management systems for public transportation facilities and equipment by October 1996. TCRP Project E-4, Guidelines for the Development of Public Transportation Management Systems, was selected by the TOPS

Committee in December 1993 to provide assistance to state DOTs and transit agencies in complying with this regulation. The project was fast-tracked; *Guidelines for the Development of Public Transportation Management Systems* will be published in autumn 1995.

- ▲ *Alternative Fuel Safety.* Leaders of the New Jersey Transit Corporation and the Flixible Corporation, a manufacturer of transit buses, report that *TCRP Synthesis 1: Safe Operating Procedures for Alternative Fuel Buses* helped inform staff about safe handling procedures for new fuels such as methanol, compressed natural gas, and liquefied natural gas. These fuels are being introduced into the transit industry for environmental reasons, but their characteristics are quite different from those of diesel fuel or gasoline, making them dangerous if handled incorrectly.
- ▲ *Total Quality Management.* The concept of Total Quality Management is not new, but it has not been used extensively in strong-union industries such as public transit. The purpose of TCRP project F-3, TQM in Public Transportation, was to research the applicability of this management concept to public transportation. The results indicate that TQM can work in the transit industry if properly implemented. A TQM guidebook for public transit and a videotape describing experiences in four experimental TQM sites are available.

Multimodal planning presents new challenges to transportation professionals.



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SPECIAL PROGRAMS

The Special Programs Division of the Transportation Research Board (Division E) administers special research programs and provides services for continuing initiatives in transportation research. The Division manages programs for Innovations Deserving Exploratory Analysis, an initiative that emphasizes new and unconventional approaches with the potential to yield significant innovations in several broadly defined transportation target areas. The Division also supports committees monitoring and advising on the continuing operation of the Long-Term Pavement Performance studies, initiated by the Strategic Highway Research Program. The Division manages the LTPP Information Management System and periodically synthesizes research analyses of LTPP data. Through Division E, TRB also provides advice and assistance to the Federal Highway Administration and the members of the American Association of State Highway and Transportation Officials on the implementation of the SHRP research results. These long-term programs are guided by committees whose members are leaders and technical experts from different segments of the transportation community.

Innovations Deserving Exploratory Analysis

The Division manages three Innovations Deserving Exploratory Analysis programs that encourage the investigation of innovative but untested concepts that could lead to technological breakthroughs in transportation. The investigations are pursued through small contracts designed to demonstrate the feasibility of these concepts. Participating researchers respond to announcements soliciting proposals in general areas of interest to the transportation community.

Highway-related research is funded through the National Cooperative Highway Research Program-IDEA program, with additional sponsorship from FHWA. Transit-IDEA is funded through the Transit Cooperative Research Program. ITS-IDEA (formerly IVHS-IDEA), supporting innovations in intelligent transportation systems, is sponsored by FHWA, the National Highway Traffic Safety Administration, and the Federal Railroad Administration. FRA became a sponsor in 1995.

By June 1995 approximately 800 proposals had been reviewed by the various IDEA program committees and panels. Research was under way on 78 projects. Program announcements have

been distributed to initiate a new cycle of proposals and awards. A surprisingly high percentage of the projects nearing completion show potential for deployment in the transportation arena. Near-term development by commercial interests seems likely for a number of the concepts emerging from IDEA. The IDEA programs continue to be successful in attracting new talent to transportation research, and defense conversion proposals are still frequently submitted.

NCHRP-IDEA has received the most proposals among the three programs, and experience so far indicates that about one NCHRP proposal in 14 is ultimately funded. The average dollar value of these awards is approximately \$75,000. The first annual summary of progress for NCHRP-IDEA was distributed in December 1994. Of the first four projects completed, two seem headed for early deployment: *Guidelines for Low-Cost Sprayed Zinc Galvanic Anode for Control of Corrosion of Reinforcing Steel in Marine Substructures*, by the University of South Florida and the Florida Department of Transportation; and *Conservation Traffic Control Load Switch*, by CLS, Inc., of Westerville, Ohio.

Research was completed on five ITS-IDEA projects. Within ITS-IDEA, one proposal in nine has been recommended for funding. The number of proposals is increasing rapidly. Sixty proposals were received in March and April 1995 alone.

The average dollar value of the ITS-IDEA awards is approximately \$90,000. Cost sharing from other sources raises the total value of the projects by about another 30 percent. The first annual summary of progress for ITS-IDEA was published in September 1994.

Several of the recently completed ITS-IDEA projects deserve special mention:

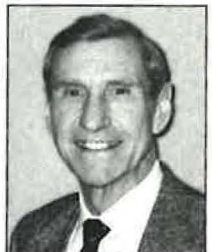
- ▲ *Improved Metropolitan Area Transportation (IMATS): Carpooling and Computerized Vehicle Dispatching in Association with a Vehicle Rental System*, by C.F. International, Verdi, Nevada, is undergoing practical field trials at the University of Nevada at Reno.
- ▲ *The Driver-Adaptive Warning System*, by Honeywell Technology Center, Minneapolis, Minnesota, has proven capable of dramatically reducing the false-alarm rates of sensor systems that alert vehicle operators of hazardous conditions. Guidelines were developed for applying the system to ITS.



Neil F. Hawks,
Director, Special
Programs



Charles L. Miller,
Chairman, TRB
Strategic Highway
Research Committee

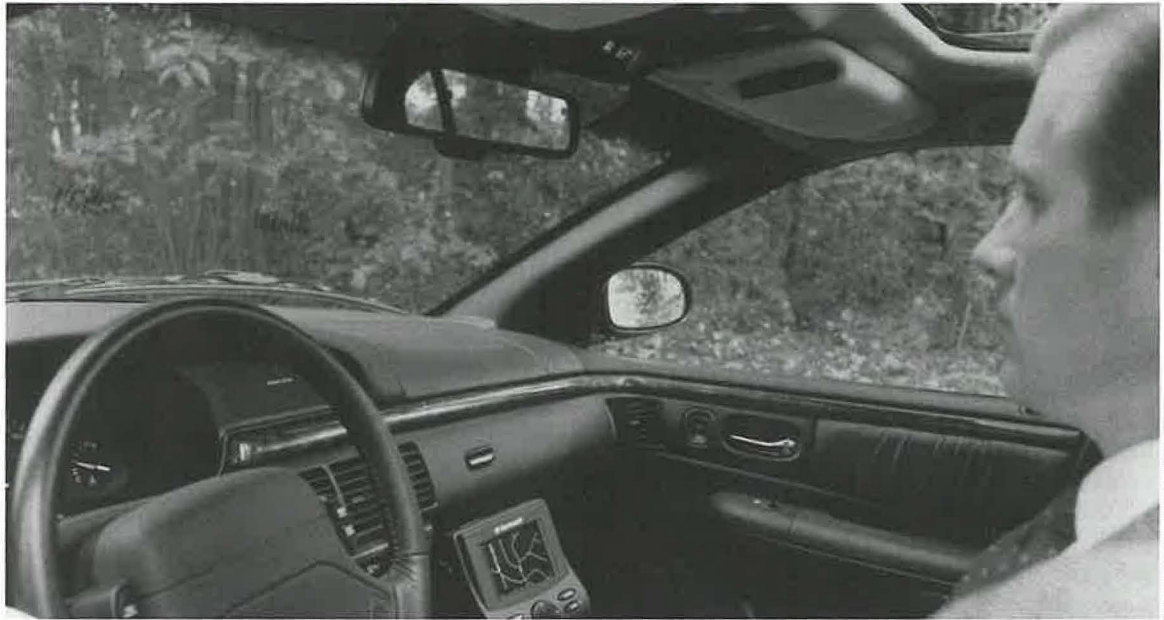


**William J.
MacCreery,**
Chairman, Pavement
Performance
Advisory Committee



William G. Agnew,
Chairman, Advisory
Committee for the
ITS-IDEA Program

New applications to enhance intelligent transportation systems are encouraged through ITS-IDEA.



ROCKWELL AUTOMOTIVE

▲ *A Distributed Input/Output Subsystem for Traffic Signal Control*, by Louisiana State University, Baton Rouge, has been very successful and commercial development seems certain.

▲ *The Laser-Based Vehicle Detector/Classifier*, by Schwartz Electro-Optics, Inc., Orlando, Florida, is now commercially available.

As of June 1995 Transit-IDEA had funded 12 projects from 178 proposals submitted. Completed projects include the following:

▲ *Customer Satisfaction Index for the Mass Transit Industry*, by the TriCounty Metropolitan District of Oregon and J.D. Powers, Inc., Los Angeles, California.

▲ *Real-Time Transit Data Broadcast*, by Transcom International, Ltd., of Winnipeg, Manitoba, Canada, is being actively introduced into the commercial market.

Long-Term Pavement Performance

The goal of the Long-Term Pavement Performance program is to discover, through a series of rigorous long-term field experiments on highways in service, the physical relationships governing long-term performance of highway pavements. For a five-year start-up period, LTPP studies were administered by the National Research Council as part of SHRP. With the sunset of SHRP, FHWA has assumed day-to-day operations of the studies. The TRB-SHRP

Committee, assisted by the TRB Pavement Performance Advisory Committee, provides general guidance and technical oversight of the continuation of these studies through their projected 20-year life.

The Pavement Performance Advisory Committee and the TRB-SHRP Committee are currently engaged in advising FHWA on the development of a strategy for future LTPP data analysis that will yield products needed by the highway community.

TRB also maintains the LTPP Information Management System (IMS). The IMS stores data collected from LTPP test sections located in every state, each Canadian province and, in the future, at least 14 other countries. Two countries, Japan and The Netherlands, have submitted data for inclusion in the IMS. The LTPP data are summarized and tabulated by the system to assist pavement researchers in evaluating existing pavement engineering practices and policies and developing improved methods, practices, and strategies for the future. Reports from the LTPP IMS may be used to determine the effects on pavement distress and performance of loading, environment, material properties and variability, construction quality, and maintenance levels and to determine the effects of specific pavement design features on pavement performance.

When the Sixth Annual Data Release of the IMS was completed in October 1994, the size of the LTPP IMS data base stood at 4.3 gigabytes. TRB and FHWA are cooperating to develop tools that

will help researchers navigate the data base and locate the data required for specific studies. During the past year approximately 100 requests for LTPP data were received from researchers around the world.

In fiscal year 1996, FHWA will be assuming all operating functions for the LTPP IMS. This change should improve the cost efficiency of the physical operation. TRB will continue to monitor operations and provide advice as necessary to improve data access and ensure data quality.

SHRP Product Implementation

Research under Strategic Highway Research Program sponsorship ceased in 1993. Active measures to encourage the implementation of the research findings are being undertaken by FHWA, AASHTO, and individual state highway agencies. Only effective implementation of SHRP products will make the \$150 million research effort pay off for the nation's transportation agencies.

The TRB-SHRP Committee serves as a major advisor to FHWA, AASHTO, and the states regarding technology transfer and implementation activities. The committee, chaired by Charles Miller, Secretary of Transportation for West Virginia, works closely with AASHTO and the FHWA Office of Technology Applications. The committee provides advice on technology transfer, standards setting, and other tasks to encourage acceptance and use of SHRP research products by transportation agencies. The committee functions as an independent sounding board for FHWA and AASHTO implementation plans. The committee also provides feedback to FHWA

and AASHTO on the progress of implementation among user agencies.

The TRB-SHRP Committee has focused its attention on support mechanisms for the implementation of SHRP research products so that the efforts of FHWA and AASHTO will remain effective in the long term. Letter Reports of committee advisory recommendations are forwarded to the Executive Directors of FHWA and AASHTO. Both organizations put the recommendations into practice whenever possible.

For example, the committee has continued to stress the need for mechanisms to provide long-term support for the software packages that have emerged from SHRP, which have the potential for widespread application among state transportation agencies. In response, AASHTO has initiated steps to support those programs valuable to state transportation agencies through its "AASHTOWare" software development and support program. FHWA is providing interim development and user support for some of these programs.

The committee also recommended an assessment of the anticipated return on the investment in SHRP research. Such an assessment would not only give indicators of the overall effectiveness of the SHRP effort, but would also guide FHWA and AASHTO in the implementation effort. Products that promise the highest return will get the most attention. FHWA has taken the lead in this assessment. The AASHTO member agencies will provide performance and cost data on early applications of the SHRP products so the assessment will reflect actual experience.



John Van Berkel,
California
Department
of Transportation,
and **C. Michael
Walton,** University
of Texas at Austin,
participate in
SHRP Expert
Task Group on
Traffic Data
Collection and
Analysis.

TOBIAS



Marcia A. Appel,
*Director,
Administration and
Finance*

The Administration and Finance Division (Division C) provides personnel and other administrative support for TRB staff; financial management of the contracts and grants that support the work of TRB; administration of the publications program; and maintenance of affiliate and sponsor services. The Division also serves as a liaison to the National Research Council/National Academy of Sciences administrative and financial offices.

Financial Management

The Division is responsible for the preparation of the TRB operating budget, individual project budgets, expenditure controls, verification of accounts, and administration of contracts and grants. Total expenditures for all TRB activities in fiscal year 1995 were \$37,442,766, of which \$22,682,166 financed the activities of the Cooperative Research Programs—the National Cooperative Highway Research Program and the Transit Cooperative Research Program. The balance of \$14,760,600 supported TRB technical activities, including core support activities; special continuing programs; and policy studies and other contract-supported studies, conferences, and workshops (deliverables).

The major source of financial support for TRB's core support activities is sponsorship. Sponsors are the National Asphalt Pavement Association, American Automobile Manufacturers Association, Association of American Railroads, American Public Transit Association, and American Trucking Associations; eight agencies of the U.S. Department of Transportation; the U.S. Army Corps of Engineers; and the highway and transportation departments of the 50 states, the District of Columbia, and Puerto Rico. The highway and transportation departments account for over one-half of the total revenue of the TRB core support activities and sponsor most of the activities of NCHRP, which is also supported by the Federal Highway Administration. TCRP is financed entirely by the Federal Transit Administration.

Publications

TRB's broad and timely distribution of its books and other reports continues to be a major resource for disseminating transportation research results and technology worldwide. The Board is valued for its role as a prominent generator of reports on the state of the art in specific areas of transportation, results of transportation research, reports addressing major national transportation policy issues, and analysis research needs.

TRB books and reports cover 16 broad categories and topics and include the following series:

- ▲ *TR News*, a bimonthly magazine, features timely articles on innovative and current research and practice in all modes of transportation. New items of interest to the transportation community, profiles of transportation professionals, meeting announcements, and highlights of TRB activities are also featured.
- ▲ *Conference Proceedings* present the papers given and summarize discussions held at conferences and workshops convened by TRB.
- ▲ *Special Reports* contain the results of congressionally mandated and other policy studies conducted by TRB on a wide variety of timely topics.
- ▲ *State-of-the-Art Reports* summarize and evaluate the status of research in a particular area.
- ▲ *Transportation Research Circulars* contain committee reports considered to be of immediate but not necessarily long-term interest.
- ▲ *NCHRP and TCRP Reports* are the final reports on research conducted under these programs.
- ▲ *NCHRP and TCRP Syntheses* present up-to-date information on selected topics and point the way toward recommended practices.
- ▲ *NCHRP and TCRP Research Results Digests* are issued as needed to provide news about the results of research projects before the final reports are published.
- ▲ *Legal Research Digests* provide preliminary news about and encourage application of research results from an ongoing project of NCHRP, Legal Problems Arising Out

of Highway Programs, and an ongoing TCRP project, Legal Aspects of Transit and Intermodal Transportation Programs.

- ▲ *Transportation Research Records* contain technical papers, grouped by subject, which are generally prepared for TRB Annual Meetings and accepted for publication through TRB's peer review process. Approximately 40 to 50 volumes (about 600 papers) are published annually, representing almost one-half the total material prepared and disseminated by TRB. The papers presented at each Annual Meeting and approved for publication are published within 6 to 15 months after presentation.
- ▲ *The Transportation Research Information Services* data base is available as part of the TRANSPORT CD-ROM (see page 13 for more information).

The Division distributes and maintains an inventory of the publications and videotapes that report on the results of research supported by the Strategic Highway Research Program (SHRP). The full collection of SHRP reports is also available on CD-ROM.

A complete listing of TRB publications issued during fiscal year 1995 appears on pages 28 and 29. TRB and SHRP publications can be purchased directly through the TRB Business Office and at a number of bookstores. The TRANSPORT CD-ROM can be purchased through SilverPlatter in Norwood, Massachusetts, and Chiswick, London, United Kingdom.

Affiliate and Sponsor Services

Individual affiliates, student affiliates, organizational affiliates, sustaining affiliates, and sponsors contribute to the support of TRB activities through annual fees based on the level of services they select. Individual and student affiliate benefits

include use of the TRB library, a reduced registration fee for the Annual Meeting, reduced fees for the use of TRB computer-based information services, a free subscription to *TR News*, and discounts on most TRB books and reports. Organizational affiliates are firms, corporations, institutions, and agencies committed to the advancement of knowledge about the nature and performance of transportation systems and their components. Fees for organizational affiliates are established to provide three levels of benefits. In addition to the benefits received by individual affiliates, organizational affiliates receive most publications at no cost and complimentary registrations to the TRB Annual Meeting. Sustaining affiliates make significant contributions toward the support of TRB. Fees for sustaining affiliates are based on the actual benefits and services they select. Sponsors—including state highway and transportation departments, the modal administrations of the U.S. Department of Transportation, the U.S. Army Corps of Engineers, and a number of nongovernment organizations—provide the major source of financial support for TRB core technical activities.

The affiliates program is linked to the TRB publications program by a selective distribution process maintained by the Board, through which affiliates receive publications of specific interest to them. Sponsors and sustaining and organizational affiliates receive at least one copy of most TRB publications at no additional cost. Individual and student affiliates who choose to participate in the selective distribution program receive publications at a substantially reduced cost.

Information on the individual, student, organizational, and sustaining affiliates can be obtained from the TRB Affiliates and Sponsor Services Office (see page 30).

STATEMENT OF INCOME AND EXPENDITURES (Fiscal Year Ending June 30, 1995)^a

INCOME	Federal	State	Other	Total
CORE SUPPORT ACTIVITIES, SPECIAL CONTINUING PROGRAMS, AND DELIVERABLES				
Research Correlation Service (state highway and transportation departments)		\$4,453,985		\$4,453,985
Federal Highway Administration	\$6,296,267 ^b			6,296,267
Federal Transit Administration	263,999			263,999
National Highway Traffic Safety Administration	349,126			349,126
Federal Aviation Administration	140,495			140,495
Maritime Administration	80,239			80,239
Bureau of Transportation Statistics	107,787			107,787
Federal Railroad Administration	54,962			54,962
U.S. Army Corps of Engineers	50,000			50,000
Association of American Railroads (see NOTE 1., next page)			\$56,933	56,933
National Asphalt Pavement Association			50,000	50,000
American Automobile Manufacturers Association			50,000	50,000
American Public Transit Association			50,000	50,000
American Trucking Associations			50,000	50,000
Institute for Strategic Transportation Studies (see NOTE 1., next page)			179,780	179,780
The Energy Foundation (see NOTE 2., next page)			50,779	50,779
Miscellaneous (see NOTE 3., next page)			43,648	43,648
Organizational and individual affiliates			908,657	908,657
Publication sales and library subscriptions			1,004,552	1,004,552
Registration fees			576,670	576,670
Transportation Research Information Services			109,377	109,377
National Academy of Sciences			88,136	88,136
Total, Core Support Activities, Special Continuing Programs, and Deliverables (see NOTES, next page)	\$7,342,875	\$4,453,985	\$3,218,532	\$15,015,392
COOPERATIVE RESEARCH PROGRAMS				
National Cooperative Highway Research Program^c				
Federal Highway Administration	\$426,493			\$426,493
State highway and transportation departments		\$13,716,298		13,716,298
Publication sales			\$35,910	35,910
Subtotal, NCHRP	\$426,493	\$13,716,298	\$35,910	\$14,178,701
Transit Cooperative Research Program^d				
Federal Transit Administration	\$8,503,175		\$290	\$8,503,465
Cooperative Research Programs Subtotal	\$8,929,668	\$13,716,298	\$36,200	\$22,682,166
TOTAL INCOME	\$16,272,543	\$18,170,283	\$3,254,732	\$37,697,558
EXPENDITURES BY ACTIVITY				
CORE SUPPORT ACTIVITIES				
Technical Activities				
Field visits and committee activities	\$880,054	\$2,517,081	\$1,456,762	\$4,853,897
Annual meeting	156,347	434,902	251,700	842,949
Publications ^e	318,871	886,985	513,343	1,719,199
Subtotal, Technical Activities	\$1,355,272	\$3,838,968	\$2,221,805	\$7,416,045
Transportation Research Information Services	305,999	615,017	355,941	1,276,957
Total, Core Support Activities	\$1,661,271	\$4,453,985	\$2,577,746	\$8,693,002
SPECIAL CONTINUING PROGRAMS				
TRB SHRP Activities	\$1,572,632			\$1,572,632
Ideas Deserving Exploratory Analysis (IDEA)	2,204,325			2,204,325
Research and Technology Coordinating Committee	287,921			287,921
Graduate Research Awards Program	92,065			92,065
Workshops on Current Problems and Issues in Aviation	24,835			24,835
Total, Special Continuing Activities	\$4,181,778			\$4,181,778
DELIVERABLES				
Studies, Conferences, Workshops	\$1,066,262		\$795,211	\$1,861,473
TRIS-FHWA Integrated Transportation Research Information System Data Base	24,347			24,347
Subtotal, Deliverables	\$1,090,609		\$795,211	\$1,885,820
Total, Core Support, Special Continuing Programs, and Deliverables	\$6,933,658	\$4,453,985	\$3,372,957	\$14,760,600
COOPERATIVE RESEARCH PROGRAMS				
National Cooperative Highway Research Program				
Technical direction		\$5,390,579		\$5,390,579
Reports and panels		992,606	\$35,910	1,028,516
Research	\$426,493	7,333,113		7,759,606
Subtotal, NCHRP	\$426,493	\$13,716,298	\$35,910	\$14,178,701
Transit Cooperative Research Program				
Technical direction	\$2,839,361			\$2,839,361
Reports and panels	441,017		290	441,307
Research	5,222,797			5,222,797
Subtotal, TCRP	\$8,503,175		\$290	\$8,503,465
Total, Cooperative Research Programs	\$8,929,668	\$13,716,298	\$36,200	\$22,682,166
TOTAL EXPENDITURES	\$15,863,326	\$18,170,283	\$3,409,157	\$37,442,766

EXPENDITURES BY OBJECT CLASS

CORE SUPPORT ACTIVITIES, SPECIAL CONTINUING PROGRAMS, AND DELIVERABLES

	Federal	State	Other	Total
Salary and related benefits	\$1,809,279	\$1,417,510	\$913,736	\$4,140,525
Overhead	1,168,794	915,711	590,273	2,674,778
Consulting	274,393	181,302	156,174	611,869
Travel	448,430	122,963	192,684	764,077
Communications and shipping	199,977	341,074	204,570	745,621
Materials and services	330,741	268,102	343,039	941,882
Data processing	1,691	5,036	1,910	8,637
Printing and copying	301,637	459,575	412,159	1,173,371
Subcontracts	1,456,120	0	2,267	1,458,387
General and administrative costs	941,265	742,713	557,475	2,241,453
Total, Core Support Activities, Special Continuing Activities, and Deliverables	\$6,932,327	\$4,453,986	\$3,374,287	\$14,760,600

COOPERATIVE RESEARCH PROGRAMS

National Cooperative Highway Research Program

Salary and related benefits		\$1,701,977		\$1,701,977
Overhead		1,099,477		1,099,477
Consulting		526,153		526,153
Travel		739,956	\$20,000	759,956
Communications and shipping	\$13	196,364	222	196,599
Materials and services		196,686	8,954	205,640
Data processing		802		802
Printing and copying		318,022	799	318,821
Subcontracts	414,061	7,759,606		8,173,667
General and administrative costs	12,419	1,177,255	5,935	1,195,609
Subtotal	\$426,493	\$13,716,298	\$35,910	\$14,178,701

Transit Cooperative Research Program

Salary and related benefits	\$996,925			\$996,925
Overhead	644,013			644,013
Consulting	261,188			261,188
Travel	371,981			371,981
Communications and shipping	97,297			97,297
Materials and services	121,194		\$242	121,436
Data processing	316			316
Printing and copying	114,467			114,467
Subcontracts	5,222,797			5,222,797
General and administrative costs	672,998		48	673,046
Subtotal	\$8,503,175		\$290	\$8,503,465

Cooperative Research Programs Subtotal

Cooperative Research Programs Subtotal	\$8,929,668	\$13,716,298	\$36,200	\$22,682,166
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TOTAL EXPENDITURES BY OBJECT CLASS

TOTAL EXPENDITURES BY OBJECT CLASS	\$15,861,995	\$18,170,284	\$3,410,487	\$37,442,766
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^a Compiled from cash basis financial records of the National Academy of Sciences.

^b Includes financing from other U.S. Department of Transportation administrations provided through FHWA contracts.

^c The National Cooperative Highway Research Program is supported through independent contracts between the National Academy of Sciences and each of the 50 state transportation departments, Puerto Rico, and the District of Columbia, by agreement with the Federal Highway Administration, U.S. DOT, permitting use of allocated federal-aid state highway planning and research (SP&R) funds.

^d The Transit Cooperative Research Program was established under the authority of Section 26(a) of the Federal Transit Act, as amended, for a project whose purpose is consistent with Section 6.

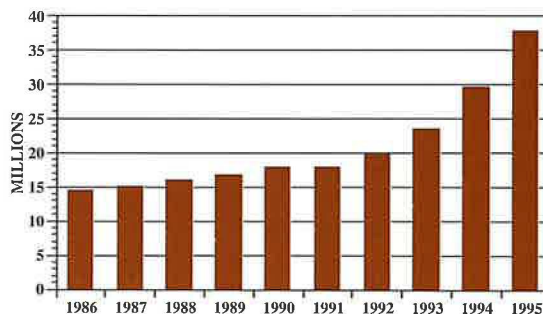
^e Includes salaries of editing and production staff and printing and typesetting costs only; does not include payments to authors or salary costs for Division A and B staff time spent on manuscript review and preparation.

NOTES

1. Grants totaling \$420,000 from the Association of American Railroads; Norfolk Southern Railroad; CONRAIL, Inc.; and the UPS Foundation finance the TRB Institute for Strategic Transportation Studies. Drawdowns from these grants during fiscal year 1995 to defray expenditures are reported in the income line item, "Institute for Strategic Transportation Studies."

2. In fiscal year 1994 a \$100,000 grant was received from the Energy Foundation for partial support of a study on sustainable transportation. Only the drawdown from this grant that was used to defray actual expenditures in fiscal year 1995 is reported in the Income section of this report. The balance of this grant was either credited as income in fiscal year 1994 or will be carried forward to cover expenditures expected to be incurred in fiscal year 1996 and will be reported as income at that time.

3. Includes financing for support of study on Approaches for Increasing Private Sector Involvement in the Highway Innovation Process from the American Concrete Pavement Association, the Asphalt Institute, the Portland Cement Association, the National Aggregate Association, the National Asphalt Pavement Association, the National Lime Association, the National Stone Association, and 3M.



ANNUAL EXPENDITURES PER FISCAL YEAR

SPECIAL FUND

In 1965, TRB established a fund to provide for orderly adjustments in the event of a temporary shortfall in anticipated revenue. The fund was built up over the years from surplus income over expenditures from earlier fiscal years that was transferred to the special fund and held in reserve for expenditures in excess of income for any fiscal year under a fixed income budget plan approved by the major sponsors on November 28, 1966. No federal funds have been involved. The TRB Executive Committee has stipulated that the total amount of the fund shall not exceed one-half of the annual budget for core technical activities.

Fund balance, June 30, 1994	\$1,929,895
Plus fiscal year 1995 income over expenditures	254,792
Balance, June 30, 1995	\$2,184,687

TRB PUBLICATIONS, FISCAL YEAR 1995

TR News, Nos. 173-178

Transportation Research Records

- 1428 Public-Sector Aviation Issues: Graduate Research Award Papers 1992-1993
- 1429 Multimodal Priority Setting and Application of Geographic Information Systems
- 1430 Freight Transportation Research
- 1431 Culvert Distress and Failure Case Histories and Trenchless Technology
- 1432 Innovations in Instrumentation and Data Acquisitions
- 1433 Public Transportation: Bus, Rail, Ridesharing, Paratransit Services, and Security
- 1434 Subsurface Drainage, Soil-Fluid Interface Phenomena, and Management of Unpaved Surfaces
- 1435 Pavement and Traffic Monitoring and Evaluation
- 1436 Asphalt Concrete Mix Materials
- 1437 Aggregates: Waste and Recycled Materials; New Rapid Evaluation Technology
- 1438 Research Issues on Bicycling, Pedestrians, and Older Drivers
- 1439 Durability of Geosynthetics
- 1440 Design and Performance of Stabilized Bases, and Lime and Fly Ash Stabilization
- 1441 Nonmotorized Transportation Around the World
- 1442 Maintenance of the Highway Infrastructure
- 1443 Travel Demand Modeling and Network Assignment Models
- 1444 Transportation Environmental Issues: Air, Noise, Water, Mitigation Processes, and Alternative Fuels
- 1445 Cross Section and Alignment Design Issues
- 1446 High-Occupancy-Vehicle Systems and Freeway Operations
- 1447 Design and Construction of Auger Cast Piles, and Other Foundation Issues
- 1448 Strength and Deformation Characteristics of Pavement Sections
- 1449 Design and Rehabilitation of Pavements
- 1450 Pricing, Economic Development, Cost Analysis, Transportation Impacts, and Transportation Management Processes

- 1451 Public Transportation 1994: Current Research in Planning and Development; Management, Marketing, and Fare Policy; and Technology
- 1452 Travel Forecasting and Supply Models
- 1453 Intelligent Transportation Systems: Evaluation, Driver Behavior, and Artificial Intelligence
- 1454 Asphalt Concrete Mixture Design and Performance
- 1455 Pavement Management Systems
- 1456 Traffic Signing, Signals, and Visibility
- 1457 Part 1: 1994 TRB Distinguished Lecture, Adolf May; Part 2: Traffic Flow and Capacity
- 1458 Concrete Research
- 1459 Parking and Transportation Demand Management
- 1460 Structures
- 1461 Airport and Airspace Planning and Operations
- 1462 Compaction of Difficult Soils and Resilient Modulus Testing
- 1463 Travel Behavior Analysis, Telecommuting, and Public Participation
- 1464 Human Engineering in Transportation Systems, User Information Systems, and Highway Safety Issues
- 1465 Construction Research
- 1466 Issues in Land Use and Transportation Planning, Models, and Applications
- 1467 Traffic and Roadway Accident Analysis and Traffic Records Research
- 1468 Recent Research on Roadside Safety Features
- 1469 Flexible Pavement Construction Issues
- 1470 Railroad Research Issues
- 1471 Recent Research on Hydraulics and Hydrology

Transportation Research Circulars

- 427 Environmental Regulatory Process: Does It Work? Dredging U.S. Ports
- 428 Spectrum Needs for Intelligent Vehicle-Highway System Application
- 429 The Licensing of Older Drivers
- 430 Interchange Operations on the Local Street Side: State of the Art

- 431 Research and Management for Advanced Traffic Signal Systems
- 432 Workshop on Safety Research Related to High-Speed Rail and Maglev Passenger Systems
- 433 TDM Innovation and Research Symposium
- 434 Older Driver Resource Directory
- 435 Roadside Safety Issues
- 436 Program of Research for Traffic Law Enforcement
- 437 Strategies for Dealing with the Persistent Drinking Driver
- 438 Instrumentation of Transportation Embankments Constructed on Soft Ground
- 439 Progress Report on Maintenance and Operations Personnel
- 440 Post-NCHRP Report 350: Issues and Research Needs
- 441 Program of Research for HOV Systems
- 443 Program of Research for Freeway Operations
- 444 Mechanically Stabilized Earth Walls
- 445 Airports of Tomorrow
- 446 Assessing Worldwide Low-Volume Roads: Problems, Needs, and Impacts

Conference Proceedings

- 3 International Symposium on Motor Carrier Transportation
- 4 Decennial Census Data for Transportation Planning
- 5 Maintenance Management
- 6 Sixth International Conference on Low-Volume Roads, Vols. 1 & 2

Special Reports

- 243 Ensuring Railroad Tank Car Safety
- 244 Highway Research: Current Programs and Future Directions

NCHRP Reports

- 364 Public Outreach Handbook for Departments of Transportation
- 365 [Fiscal Year 1996]
- 366 Guidelines for Effective Maintenance-Budgeting Strategies
- 367 Long-Term Performance of Geosynthetics in Drainage Applications
- 368 [Fiscal Year 1996]
- 369 [Fiscal Year 1996]

- 370 Performance of Epoxy-Coated Reinforcing Steel in Highway Bridges
- 371 State Departments of Transportation: Strategies for Change
- 372 Support Under Portland Cement Concrete Pavement

NCHRP Syntheses of Highway Practice

- 200 Underwater Bridge Maintenance and Repair
- 201 Multimodal Evaluation in Passenger Transportation
- 202 Severity Indices of Roadside Features
- 203 Current Practices in Determining Pavement Condition
- 204 Portland Cement Concrete Resurfacing
- 205 Performance and Operational Experience of Crash Cushions
- 206 Managing Highway Tort Liability
- 207 Managing Roadway Snow and Ice Control Operations
- 208 Development and Implementation of Traffic Control Plans for Highway Work Zones
- 209 Sealers for Portland Cement Concrete Highway Facilities
- 210 Road Pricing for Congestion Management: A Survey of International Practice
- 211 Design, Construction, and Maintenance of PCC Pavement Joints
- 212 [Fiscal Year 1996]
- 213 [Fiscal Year 1996]
- 214 [Fiscal Year 1996]
- 215 [Fiscal Year 1996]
- 216 Implementation of Technology From Abroad

NCHRP Research Results Digests

- 200 Objectives and Decision Criteria for Infrastructure Investment
- 201 BRI-STARS (BRIdge Stream Tube Model for Alluvial River Simulation)
- 202 [Fiscal Year 1996]
- 203 Continuing Project to Synthesize Information on Highway Problems

- 204 Winter Maintenance Technology and Practices: Learning from Abroad
- 205 Requirements for Application of Light Emitting Diodes (LEDs) to Traffic Control Signals
- 206 Training for Highway Construction Personnel
- 207 On the Implementation of Research Findings in Surface Transportation

NCHRP Legal Research Digests

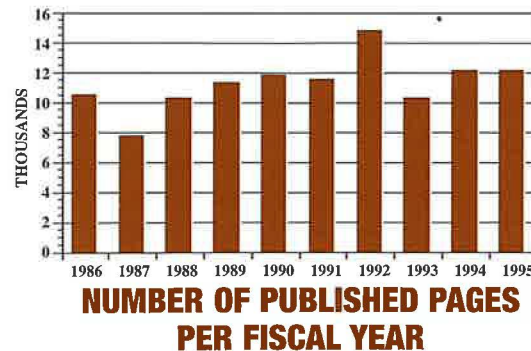
- 29 Highways and the Environment: Resource Protection and the Federal Highway Program
- 30 Legal Issues Relating to the Acquisition of Right of Way and the Construction and Operation of Highways over Indian Lands
- 31 Federal Air Quality Laws Governing State and Regional Transportation Planning
- 32 Federalism and the Intermodal Surface Transportation Efficiency Act of 1991
- 33 Freedom of Information Acts, Federal Data Collections, and Disclosure Statutes Applicable to Highway Projects and the Discovery Process

TCRP Reports

- 1 Artificial Intelligence for Transit Railcar Diagnostics
- 2 Applicability of Low-Floor Light Rail Vehicles in North America

TCRP Syntheses of Transit Practice

- 5 Management Information Systems
- 6 The Role of Performance-Based Measures in Allocating Funding for Transit Operations
- 7 Regulatory Impacts on Design and Retrofit of Bus Maintenance Facilities
- 8 Retrofit of Buses to Meet Clean Air Regulations
- 9 Waste Control Practices at Bus Maintenance Facilities
- 10 Bus Route Evaluation Standards
- 11 System-Specific Spare Bus Ratios



TCRP Research Results Digests

- 3 Total Quality Management in Public Transportation
- 4 Transit Ridership Initiative
- 5 Electronic On-Vehicle Passenger Information Displays (Visual and Audible)
- 6 Research Agenda for Increasing Transit Ridership

TCRP Legal Research Digests

- 1 Strategies to Facilitate Acquisition and Use of Railroad Right of Way Transit Providers
- 2 Successful Risk Management for Rideshare and Carpool Matching Programs
- 3 State Limitations on Tort Liability of Public Transit Operations

Other Publications

- 1994 Directory of the Transportation Research Board
- 1995 Publications Catalog
- Highway Research Abstracts, Vol. 26, No. 4; Vol. 27, Nos. 1 and 2
- Transit Research Abstracts, No. 12
- 1994 NCHRP Summary of Progress
- 1994 TCRP Annual Report of Progress
- NCHRP IDEA Program Annual Progress Report 1: Emerging Concepts and Products for Highway Systems

NOTE: Total number of publications: 129; total number of printed pages: 12,124. 6 issues *TR News* (280 pages); 44 Transportation Research Records (4,950 pages); 4 Transportation Research Conference Proceedings (1,301 pages); 19 Transportation Research Circulars (1,022 pages); 2 Special Reports (264 pages); 6 NCHRP Reports (466 pages); 13 NCHRP Syntheses of Highway Practice (1,078 pages); 7 NCHRP Research Results Digests (60 pages); 5 NCHRP Legal Research Digests (154 pages); 2 TCRP Reports (229 pages); 7 TCRP Syntheses of Transit Practice (353 pages); 4 TCRP Research Results Digests (105 pages); 9 other publications (1,862 pages).

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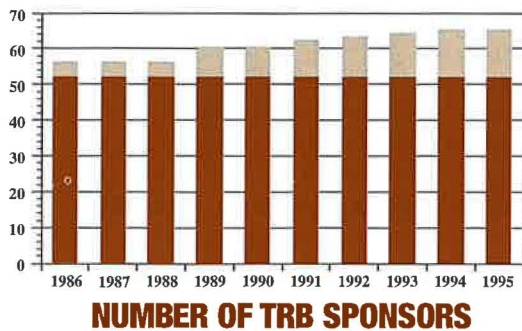
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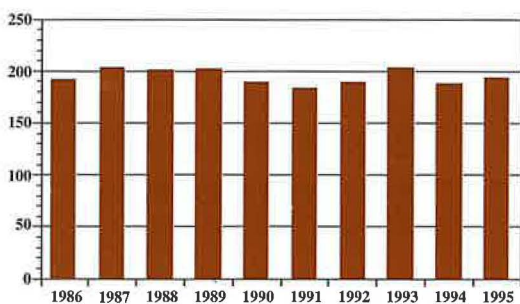
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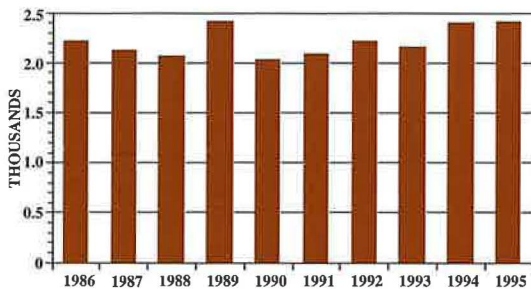
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July 1, 1994–June 30, 1995

1994

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- 13–15 19th Annual Ports & Waterways Conference,
Burlington, Vermont
- 14–16 Highway Safety Management Systems
Methodology, *Tucson, Arizona*
- 17–21 33rd Annual Workshop on Transportation Law,
Madison, Wisconsin
- 18–22 7th Maintenance Management Workshop,
Orlando, Florida
- 21–22 Workshop on IVHS Communications and
Systems Architecture, *Las Vegas, Nevada*
- 24–26 TRB Joint Summer Meeting of the Planning,
Economics, Finance and Management
Committees, *Colorado Springs, Colorado*
- 31–Aug 4 10th Equipment Management Workshop,
Portland, Oregon

SEPTEMBER

- 22 Aviation Forecast Workshop,
Washington, D.C.

OCTOBER

- 23–26 14th National Conference on Accessibility and
Mobility, *Tampa, Florida*

DECEMBER

- 7–9 5th TRB Conference on the Intermodal Freight
Terminal of the Future, *New Orleans, Louisiana*
- 7–9 Conference on Intermodal Planning Issues,
Best-Case Practice, *New Orleans, Louisiana*
- 8–9 Symposium on Performance-Based Contracting
and Specifications, *Washington, D.C.*

1995

JANUARY

- 22 28th Annual Workshop on Human
Factors in Transportation, *Washington, D.C.*
- 22–28 TRB 74th Annual Meeting, *Washington, D.C.*

MARCH

- 6–7 Forum on Future Directions in Transportation
Research & Development, *Washington, D.C.*
- 9–12 National Symposium on Disadvantaged
Business Enterprise Program in State and
Federal Highway Contracting, *Baltimore,
Maryland*
- 12–15 Household Travel Surveys, *Irvine, California*
- 20–21 Conference on International Transportation
Information Sources, Systems, and Services,
Washington, D.C.
- 22 Workshop on Portable Railroad Track
Data Collection Devices, *Chicago, Illinois*

APRIL

- 17–21 5th International Conference on Transportation
Planning Methods and Applications,
Seattle, Washington

MAY

- 7–10 2nd Annual International Traffic Management
Systems Symposium, *Seattle, Washington*
- 14–17 Symposium on Visualization, Simulation, and
Transportation, *Houston, Texas*
- 14–17 46th Highway Geology Symposium and TRB
Workshop, *Charleston, West Virginia*
- 19–21 Workshop on Performing Highway
Maintenance Using Total Quality Management,
Whitefish, Montana
- 21–24 Conference on the Role of Metropolitan
Planning Organizations in Transportation,
Williamsburg, Virginia

JUNE

- 25–29 Sixth International Conference on Low-Volume
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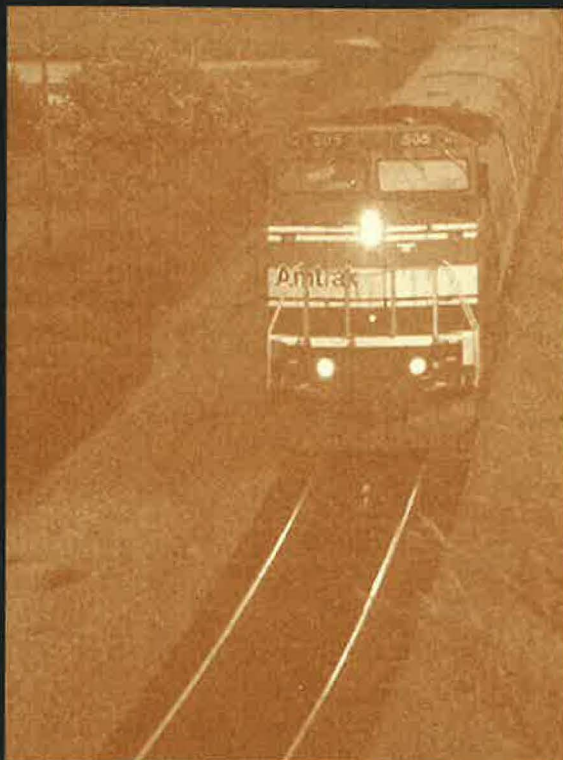
^aAs of December 1, 1995.

^bThrough November 1, 1995.

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