ANNUAL REPORT

1976

TRANSPORTATION RESEARCH BOARD
NATIONAL ACADEMY OF SCIENCES

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TRANSPORTATION RESEARCH BOARD
Commission on Sociotechnical Systems
National Research Council

National Academy of Sciences
Washington, D.C., 1976

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Robert N. Hunter, Vice Chairman

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Norbert T. Tiemann, Federal Highway Administrator (ex officio)
Robert E. Patricelli, Urban Mass Transportation Administrator (ex officio)
Asaph H. Hall, Federal Railroad Administrator (ex officio)
Harvey Brooks, Chairman, Commission on Sociotechnical Systems, National Research Council (ex officio)
Milton Pikarsky, Chairman of the Board, Chicago Regional Transportation Authority (ex officio, Past Chairman, 1975)
Warren E. Alberts, Vice President, United Airlines
George H. Andrews, Vice President for Transportation Marketing, Sverdrup and Parcel
Grant Bastian, State Highway Engineer, Nevada Department of Highways
Kurt W. Bauer, Executive Director, Southeastern Wisconsin Regional Planning Commission
Langhorne M. Bond, Secretary, Illinois Department of Transportation
Manuel Carballo, Secretary, Wisconsin Department of Health and Social Services
L. S. Crane, President, Southern Railway System
James M. Davey, Consultant, Manchester, Michigan
B. L. DeBerry, Engineer-Director, Texas State Department of Highways and Public Transportation
Louis J. Gambaccini, Vice President and General Manager, Port Authority Trans-Hudson Corporation
Howard L. Gauthier, Department of Geography, Ohio State University (liaison member, Maritime Transportation Research Board)
Frank C. Herringer, Manager-Director, San Francisco Bay Area Rapid Transit District
Ann R. Hull, Delegate, Maryland General Assembly
Robert N. Hunter, Chief Engineer, Missouri State Highway Commission
Peter G. Koltnow, President, Highway Users Federation for Safety and Mobility
A. Scheffer Lang, Assistant to the President, Association of American Railroads
Banjamin Lax, Director, Francis Bitter National Magnet Laboratory, Massachusetts Institute of Technology
Daniel McFadden, Professor of Economics, Department of Economics and Institute of Transportation Studies, University of California, Berkeley
Harold L. Michael, Professor, School of Civil Engineering, Purdue University
Thomas D. Moreland, Commissioner, Georgia Department of Transportation
J. Phillip Richley, Vice President for Engineering and Construction, The Cafaro Company
Raymond T. Schuler, Commissioner, New York State Department of Transportation
William K. Smith, Vice President–Transportation, General Mills, Inc.

EXECUTIVE DIRECTOR AND DIVISION DIRECTORS

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E. C. Squires, Assistant Director for Administration
R. C. Edgerton, Assistant Director for Regular Technical Activities
P. E. Irick, Assistant Director for Special Activities
K. W. Henderson, Jr., Program Director for the National Cooperative Highway Research Program

To the Supporting Members
of the Transportation Research Board

Fiscal year 1976 has been a critical year for the Transportation Research Board. At least three crucial questions have been asked:

1. Is the old Highway Research Board really ready to become a mature Transportation Research Board?
2. Will the sponsors of TRB increase their financial support to maintain the activities of the board and keep up with the substantial inflation of recent years?
3. Is TRB able to maintain its traditional services and yet concern itself with new issues within the reorganized structure of the National Research Council?

I think the answer to the first question is a cautious but positive "yes." The special committees on air and rail transport activities have reported out during the year. Both committees identified significant lists of topics in those modes for which TRB types of activities do not exist—topics ideally suited to attention within TRB through new committees, through workshops, and through liaison and information exchange among pertinent industries and government agencies new to the TRB family. The recommendations of these committees have been endorsed by the TRB Executive Committee and are being enthusiastically followed within the regular committee structure of the board. The 5-week-long Railroad Research Conference sponsored by the Federal Railroad Administration and the Association of American Railroads and held in the summer of 1975 was an outstanding success, and its final recommendations will undoubtedly play a significant role in the formulation of railroad research programs during the next few years. During the Fifty-fifth Annual Meeting in January 1976, several sessions were dedicated to the concerns of the air and rail communities, and some of the new committees held organizational meetings. Substantial financial support for TRB rail activities for the coming fiscal year has been assured, and preliminary inquiries in the air transport community have been encouraging.

With the support of the Urban Mass Transportation Administration, the board has established itself as a focal point for conferences, committee activity, and annual meeting programs dealing with mass transportation. That TRB has succeeded in attracting top professionals in the transit community is attested by the fact that the best attended sessions of this year's annual meeting were those dealing with public transportation.

An enthusiastic new committee dealing with inland waterway transportation has been formed. Discussions are under way with the U.S. Army Corps of Engineers to develop support for expanded inland waterway activity.

Thus, it appears that those outside of the highway field are finding TRB to be truly useful and a comfortable home for interdisciplinary and intermodal exchange in the interest of total transportation.

The answer to the second question has been extremely gratifying to the TRB Executive Committee and staff. It appears that, in spite of real financial difficulties in the states, the departments of transportation and highways will approve a cost-of-doing-business increase in subscription rate of 19.2 percent (6.03 percent per year compounded) for the next 3 years. The board's federal supporters have also agreed to this increase.

Perhaps we are overly optimistic since we have not yet received signed contracts from all sponsors. However, the basis for our euphoria and gratification is threefold. First, the response to an inquiry by one of

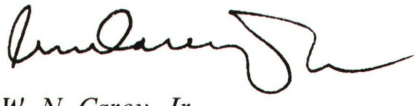
the chief administrative officers of a state transportation department asking whether the other states would support the increase showed a substantial majority that would. Second, we have received this year several highly complimentary letters from chief administrative officers of the states indicating that what TRB is doing is important to them and to the transportation community. Third, subscription contracts in support of the regular technical activities of the board were mailed to the states on April 1. Although signed contracts were not due until July 1, as of then we had received 42 plus the assurance of 8 more, which is substantially ahead of the rate at which signed contracts have been received in previous years.

In an effort to continue to warrant such support, the board has instituted several studies that are resulting in ways to improve its services to its sponsors. The studies relate to the publication program, the field visit program, the system for responding to inquiries, and the format and content of the annual meeting. Furthermore, TRB is reexamining its long-range goals.

The answer to the third question is also "yes." A year ago, the new Commission on Sociotechnical Systems of the National Research Council, under which TRB operates, was just being formed. At that time, it was unclear whether the traditional activities and mode of operation of TRB could be continued. During the past year our relations with the new commission have been very good. The commission is supportive and has been helpful in the identification of issues that might be attacked by TRB.

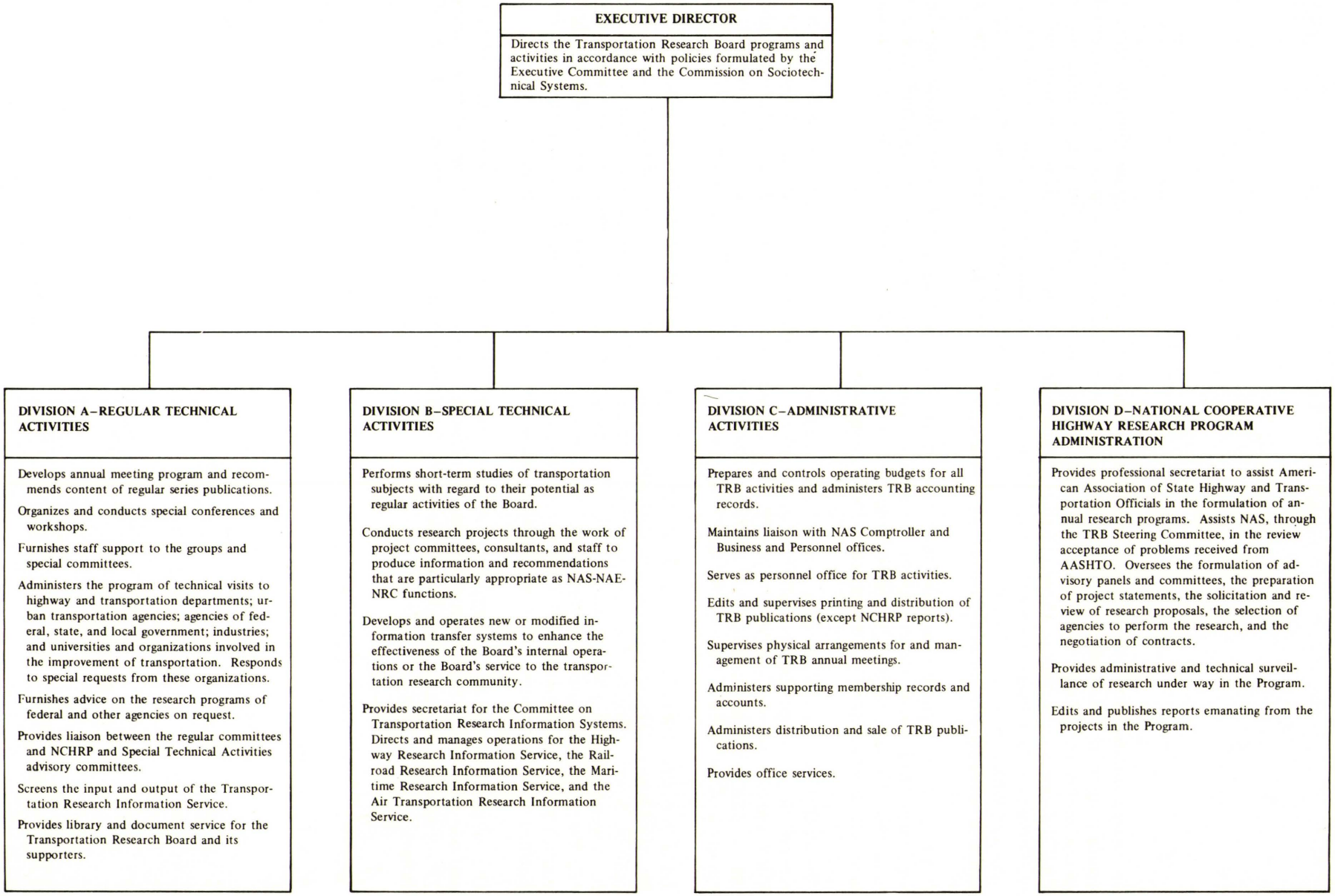
The Fifty-fifth Annual Meeting of TRB, held in January, attracted 3900 delegates, a new record in the board's history. The sessions were well attended. The technical papers and discussions were of high caliber. Nearly all of the board's committees met during the annual meeting week, and their deliberations were fruitful. The popularity of the TRB Annual Meeting as a forum for transportation researchers had led to an unfortunate circumstance. More papers are generated than can be published within the board's publication budget. This has necessitated a rescreening by the TRB committees to select for publication only those papers that can be published within a rigorous restricted quota.

Our expanded scope and our exploration of new areas and ideas demand a concerted effort by our staff and our members so that our regular, current activities are not neglected. Your continued support of the Transportation Research Board is greatly appreciated and will allow us to serve you and the public in the future.

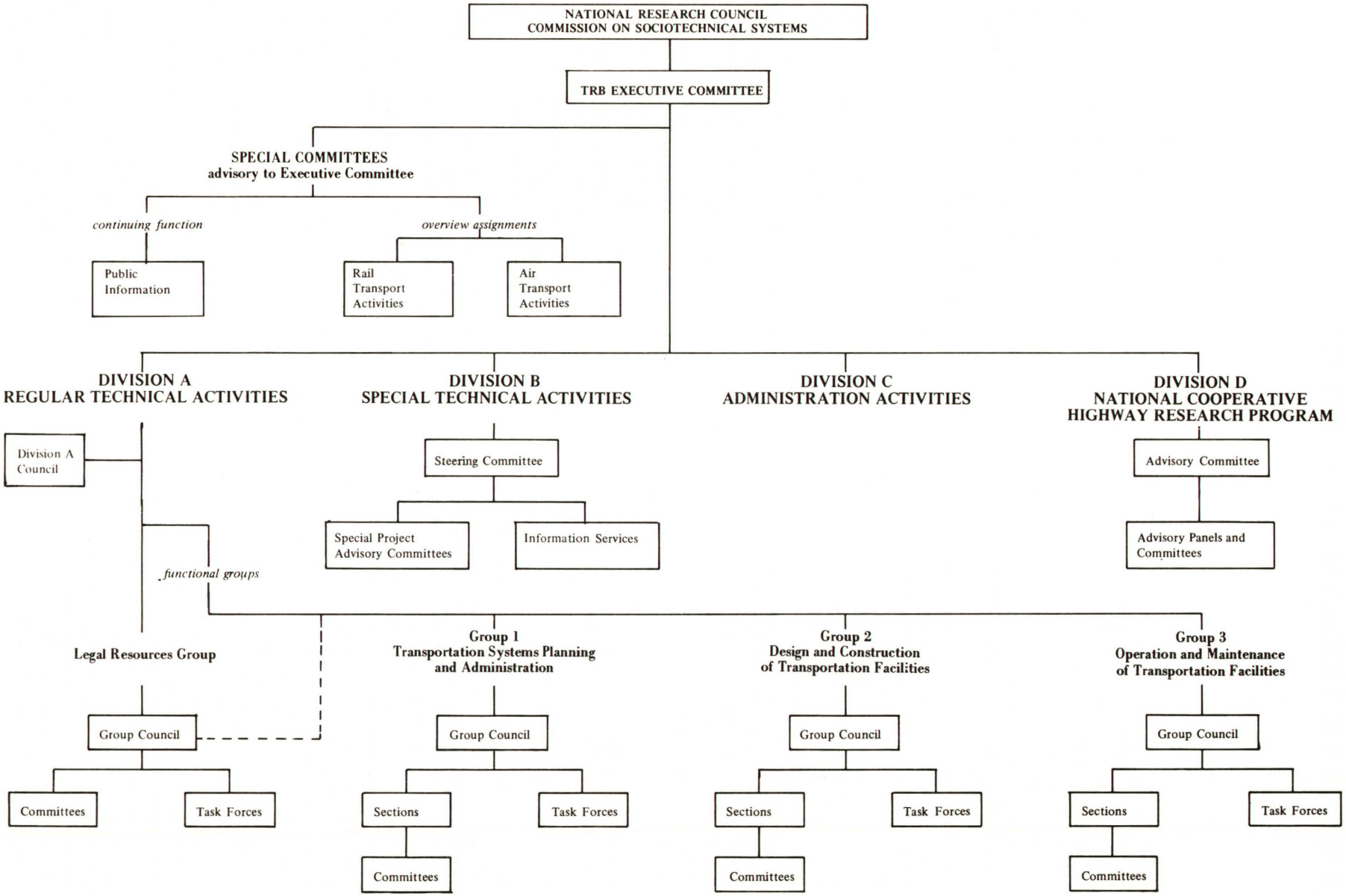


W. N. Carey, Jr.

Staff organization and responsibilities.



Transportation Research Board Organization.



REGULAR TECHNICAL ACTIVITIES

The Division A Council is the coordinating element of the division. Kurt W. Bauer, a member of the Executive Committee, replaced Harold L. Michael as chairman of the council as Professor Michael assumed the chairmanship of the board's Executive Committee.

The council considers the allocation of resources, including program space and publication pages, to the groups and coordinates activities and subjects involving 2 or more groups.

As a responsibility of the Division A Council, the Eighth Summer Meeting on the theme, A Look at Future Transportation, was held in Ann Arbor, Michigan, August 4-7, 1975, in cooperation with the Michigan Department of State Highways and Transportation and the University of Michigan. The meeting was arranged by a task force chaired by Donald E. Cleveland. Because of an increasing number of special meetings on many subjects, the summer meeting series was discontinued with the Ann Arbor meeting.

Other items receiving council attention are compatibility of standards between vehicles and highways and the development and use of research project statements.

GROUP 1—TRANSPORTATION SYSTEMS PLANNING AND ADMINISTRATION

E. Wilson Campbell, chairman

Major emphasis in Group 1 this past year was on establishing new committee activities in the Organization and Administration Section and in the Social, Economic, and Environmental Factors Section and on continuing task force efforts to review Group 1 activities such as the coordinating of research needs statements that are developed by the standing committees and the publication procedures and policies for papers and reports as developed by the committees. The conduct of special workshops and conferences continued to be a major focal point of committee and staff activity in Group 1.

A new Committee on the Policy Development Process has been formed in the Organization and Administration Section. The scope of this committee is to evaluate and disseminate information on the process of developing transportation-related policies. In the Social, Economic, and Environmental Factors Section a new committee has been formed on Transportation for the Disadvantaged. The scope of this committee is to study the problems relating to the transportation disadvantaged, the services that various modes of transportation should provide for them, and the impact and value of programs directed at improving their mobility.

In the Social, Economic, and Environmental Factors Section, the Committee on Implementation Strategies for Coordinated Transportation and Land Development changed its name to the Committee on Joint Development of Land and Transit Systems and broadened its scope to include investigation of coordination tools and techniques of nationally and locally sponsored implementation of transit and urban development.

Many special workshops and conferences were held under the auspices of Group 1 committees. The following reports have been published as a result of these special purpose activities:

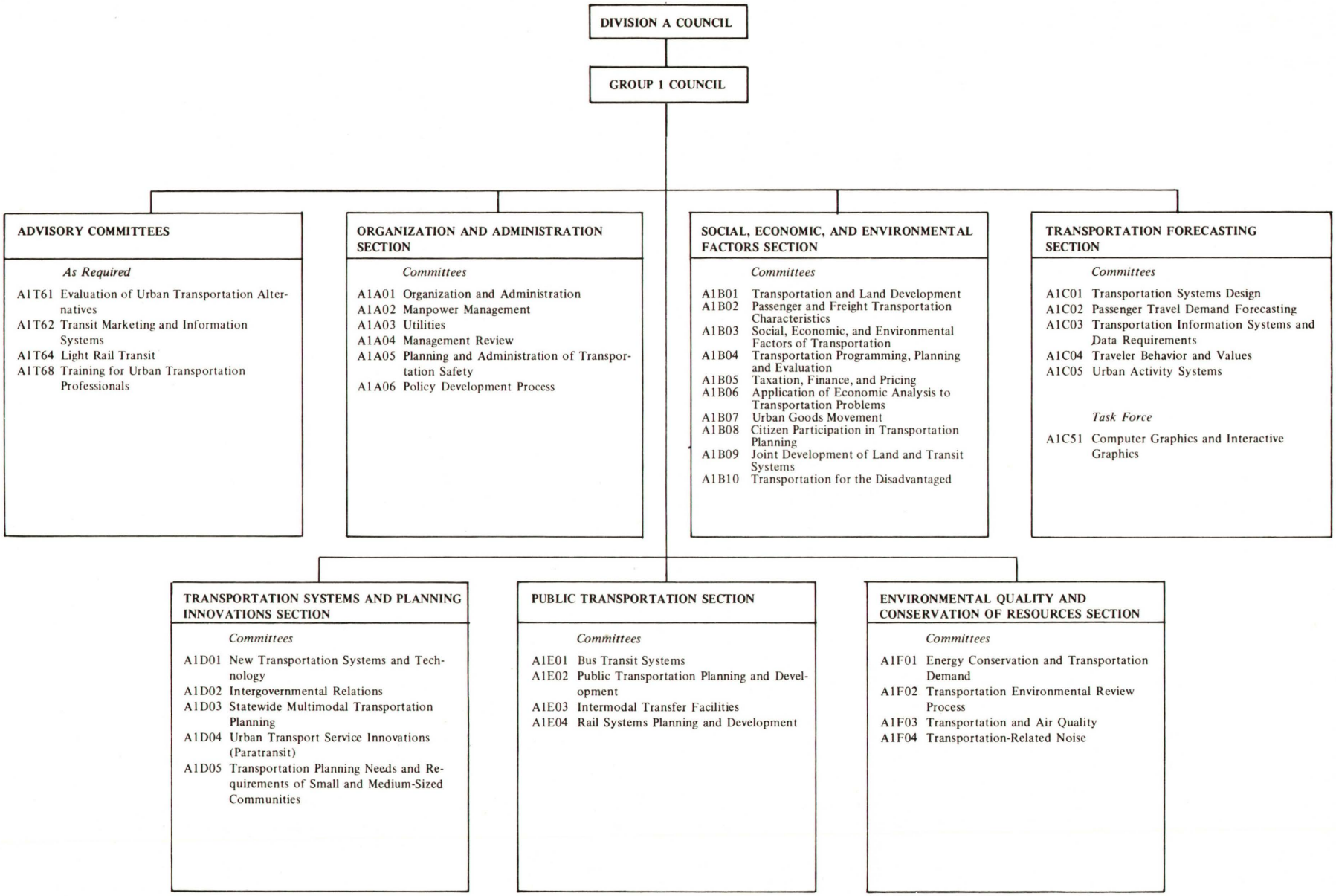
Transportation Programming Process, Special Report 157
Airport Landside Capacity, Special Report 159
Light Rail Transit, Special Report 161
Paratransit, Special Report 164
Evaluation of Urban Transportation Alternatives, unpublished report submitted to the Urban Mass Transportation Administration
Energy Use in Transportation: Potential for Cooperative Research, unpublished report submitted to the Office of International Programs, U.S. Department of Transportation
Proposed Urban Transportation Data Reporting Requirements for States and Metropolitan Planning Organizations, unpublished report to the Federal Highway Administration and the Urban Mass Transportation Administration

Other special workshops, conferences, and activities sponsored by the various committees include the following (details are given on later pages).

Conference on Socioeconomic Experience Abroad
Workshop on the State of the Art of Noise Prediction Techniques
Workshop on Strategies for Reducing Gasoline Consumption Through Improved Motor Vehicle Efficiency
Workshop on the State of the Art of Assessing Transportation-Related Air Quality Impacts
Workshop on Urban Transportation Pricing Alternatives
Sixth International Conference on Demand-Responsive Transportation Systems and Other Paratransit Services
Conference on Mass Transportation Management

Work is also progressing on the development of a glossary of public transportation planning terms. The publication of *Newsline,* a monthly newsletter widely

Organization of Group 1—Transportation Systems Planning and Administration.



distributed to those interested in public transportation planning, has been taken on by TRB after a trial period of 6 months.

The various committees of Group 1 are currently working on the development of special workshops and conferences in the following areas: rural public transportation, coordinated transit services and facilities, state role in transit management, transportation systems management, and transportation for the disadvantaged.

GROUP 2—DESIGN AND CONSTRUCTION OF TRANSPORTATION FACILITIES

Eldon J. Yoder, chairman

Group 2 activities have been concentrated in 2 areas during the past year. First, in step with the expanding role of of TRB in transportation, Charles L. Blake has been added to the Group Council to bring expertise in air transportation research. A Conference on Research in Airport Pavements will be sponsored at Atlanta, Georgia, November 1976, funded by the Federal Aviation Administration. Second, the group has increased its efforts to assist transportation agencies in the protection of their capital investments in travel way and terminal construction. All committees have been asked to develop strategies for their areas of concern.

The group has been concerned with the reduction in TRB resources to meet the needs for dissemination and correlation of information in these vital areas. The reduction in publication page budget has put a severe restriction on the current standing committees in their efforts to meet these needs. Serious doubts are being expressed within committees and sections that the current level of interest and performance can be maintained under this circumstance. At the same time it puts a formidable constriction on the new committees formed to support the expanding role of TRB.

Responding to national interest, a Workshop on Optimizing the Use of Materials and Energy in Transportation Construction was conducted November 1975 under the guidance of a Group 2 Task Force. The workshop was funded by Federal Highway Administration, Energy Research and Development Administration, and Federal Energy Administration. The results of the workshop were presented at the Annual Meeting in January 1976 and have been published in Special Report 166.

The Roy W. Crum Award was presented at the 1976 Annual Meeting to John L. Beaton, a retiring member of the council. Beaton joins a group of hard-working, dedicated men who have completed their terms as members of the council. The council is indeed indebted for the outstanding contributions of past chairman W. B. Drake and members A. L. Elliot, L. F. Erickson, T. D. Larson, D. W. Loutzenheiser, H. H. Newlon, Jr., R. D. Schmidt, and F. W. Thorstenson. New members welcomed and immediately appointed tasks in addition to C. L. Blake are C. F. Crumpton, D. S. Gedney, L. A. Herr, L. H. Moore, E. F. Nordlin, D. L. Royster, I. M. Viest, and L. G. Walker.

Responding to the demands of the transportation community, Group 2 committees organized symposia, conferences, and formal paper sessions for the Annual Meeting on pavement management systems, flexible pavement design and performance, and rutting of asphalt concrete pavements. The continuing concern for public safety was addressed in sessions on surface properties and vehicle interaction, pavement condition, evaluation, safety appurtenances, shoulder design, and roadway design in seasonal frost areas.

The need for economy in accord with durability and performance was discussed in sessions on quality assurance systems, consolidation of concrete, performance of concrete, basic research in cement and concrete, concrete admixtures, alkali-silica reactions, concrete bridge decks, and corrosion.

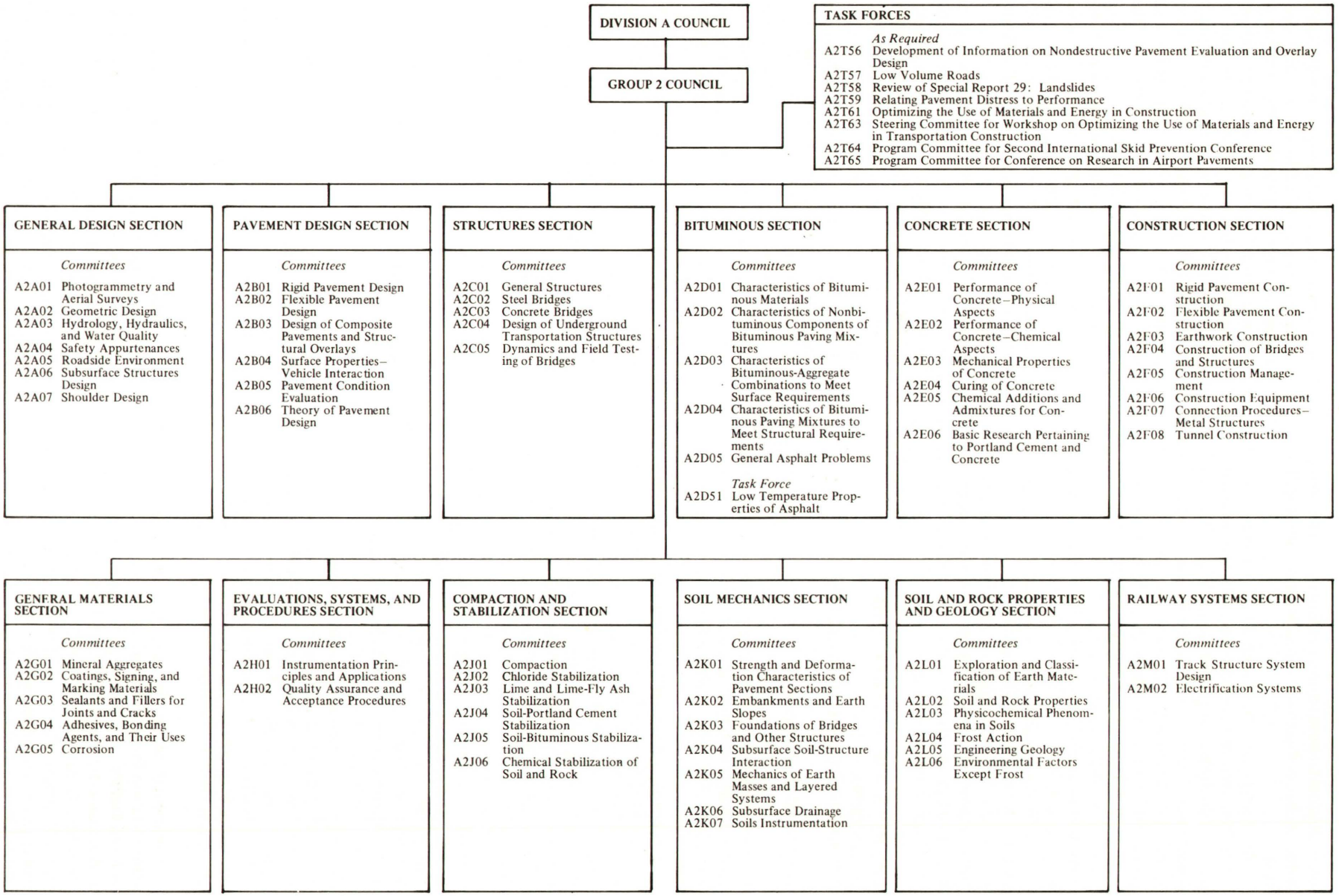
Providing service to other areas of interest is another of the outstanding contributions of the group as exemplified by the sessions on visual aspects of transportation facilities, including airports, transit, transmission lines, and highways; on aerial surveys; and on tools for transportation planning, environmental analysis, and communicating with the public.

The pressing needs for more research in areas of bridge design were addressed in a special session on steel structures. Problems and solutions were covered in sessions on the Rio Niteroi Bridge design and field testing. The use of materials and soils in place to produce economical and durable roadway structures was discussed in several sessions on soil stabilization. The perception and correction of the hazards of mine and cavern subsidence under roadways were considered in a special session. Performance of embankments of waste materials and those over soft, varved clays was discussed. Sessions on asphalt durability, stress-absorbing membranes, bituminous mixtures, construction, and aggregates rounded out a full and successful Annual Meeting.

The group continues to take leadership in areas of concern to transportation and highway departments through its organization of task forces to advise on the organization and administration of various conferences and workshops. A Conference on Low-Density General Aviation Airports is being planned for the fall of 1978 or 1979, and the Second International Conference on Low-Volume Roads is being organized for the summer of 1978. Group 2 Council members are also active in the plans for the International Conference on Concrete Pavement Design, Lafayette, Indiana, February 1977; the Second International Skid Prevention Conference, Columbus, Ohio, May 1977; and the Fourth International Conference on Structural Design of Asphalt Pavements, Ann Arbor, Michigan, August 1977. Task forces have been organized to help administer the conferences on skid prevention and on airport pavement research.

As recommended by the Task Force on Rail Transportation Facilities, the Committee on Track Structures System Design and the Committee on Electrification Systems have been organized and placed under the newly formed Railway Systems Section. New members representing rail interests and expertise are being added to

Organization of Group 2—Design and Construction of Transportation Facilities.



other appropriate committees in Group 2. The task force, having completed its task, was discharged with thanks.

Again this year some Group 2 Council members and committee members participated in the review and critique of the following projects in the FHWA Federally Coordinated Program of Highway Research and Development: 1T–Advance Vehicle Protection Systems, 4G–Substitute and Improve Materials to Reduce the Effects of Energy Problems on Highways, and 5D–Structural Rehabilitation of Pavement Systems. The Group 2 Council continues to endorse this activity and is pleased to participate in it.

The Group 2 organization now includes 65 committees and 8 task forces. The Standing Committee of the Council on Organization, Scope, and Functions continues to examine the group organization to ensure an efficient and productive expenditure of TRB resources in the Group 2 area of concern.

GROUP 3–OPERATION AND MAINTENANCE OF TRANSPORTATION FACILITIES

Adolf D. May, chairman

Group 3 is challenged to find ways of handling increased responsibilities with limited resources by broader horizons, greater intensities, public focus, and dynamic changes.

The horizon of Group 3 Council and its committees is broadening to other forms of transportation and to increased attention to freight movement as well as people movement. New committees and task forces (Transit Service Characteristics, Operator Regulation, Urban Systems Operations, Transportation Vehicle Research, Airport Landside Operations, and Ride Quality) and existing committees are expanding to focus attention on mass transportation and other modes. Simultaneously, a reassessment of group activities has resulted in reassignment of activity of the discontinued Task Force on Driver Regulation and committees on Vehicle Inspection and Regulation, Maintenance of Traffic Control Devices, and Vehicle Characteristics.

The depth and intensity of activities of Group 3 Council and its committees are increasing. Systems approach and large-scale analytical techniques are being required. Multimodal implications and multidisciplinary team efforts are being recognized as essential. Measures of evaluation are being extended to environmental, energy, and social issues. Greater emphasis is needed in implementing the results of research.

Public focus on the operation and maintenance of transportation facilities has increased because of the reduced facility construction program on the one hand and demands by the public for high levels of service on the other. Greater attention will be required in areas such as traffic management, airport landside operations, and recycling and maintenance of highway and rail facilities. Research must be intensified to find better ways of operating and maintaining transportation facilities.

Resources are limited in 4 ways: personnel, travel, annual meetings, and publications. The personnel of Group 3 consists of voluntary council and committee members and TRB staff. There are no plans to increase Group 3 staff size, and most voluntary members are encountering greater demands on their time from normal employment. With travel costs increasing and with travel budgets being limited both at TRB and at supporting organizations, the frequency and the size of council and committee meetings have been limited. For example, in 1976 the Group 3 Council will hold only 1 midyear meeting instead of the usual 2. The number of Group 3 formal technical sessions at the 1977 Annual Meeting will be limited, affecting the number of papers accepted and the number of conference sessions held. The publication page quota for 1976 for Group 3 is 1200 pages. This resulted in publication in full of only 56 papers from among 120, chosen from almost 200 papers offered to the group.

Although it is clear that responsibilities are increasing and resources are limited, Group 3 has accepted the challenge and proposes to expand activities by performing them better through improved organization and continued dedication of members and staff. An important contribution to this effort was made by converting the organization from 6 sections to 3 sections and constituting a development committee within the group to guide and coordinate the activities of the committees within each section.

A number of conferences and workshops were held during the year (details are given on later pages). In addition, committees were active in reviewing projects in the FHWA Federally Coordinated Program of Highway Research and Development and responding to new demands in the areas of transportation systems management and maintenance research. The group and its committees have continued to function as a technical and administrative team, guiding and stimulating research and providing an effective forum for the reporting of research findings.

LEGAL RESOURCES GROUP

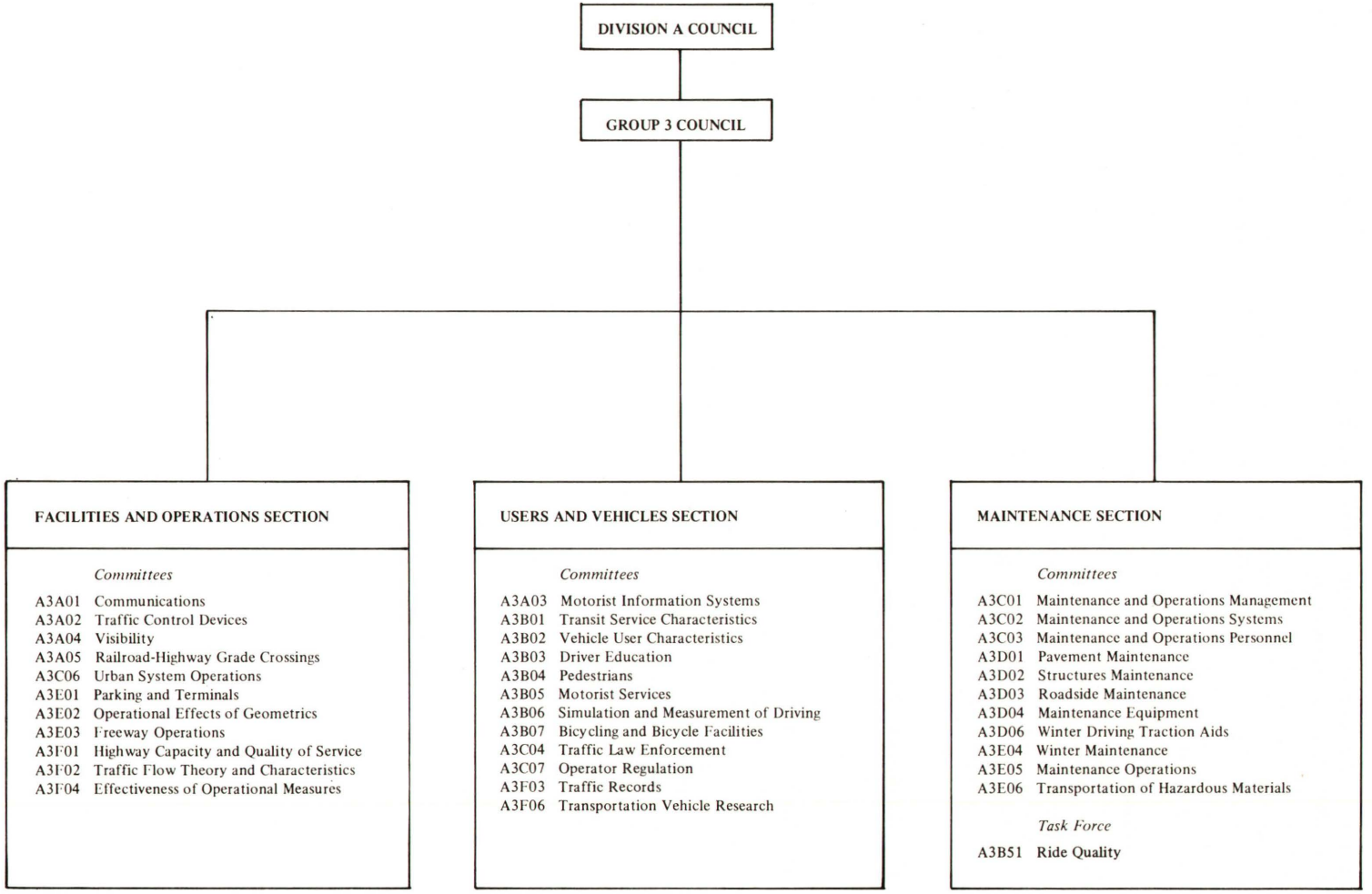
Nolan H. Rogers, chairman

Restructuring of the committees of the Legal Resources Group to expand the scope of their activities in keeping with the widened scope of TRB activities has continued.

The Fourteenth Annual Workshop on Transportation Law was held in San Diego, July 27-31, 1975, and was presented in cooperation with the California Department of Transportation. The program was well received by the 80 lawyers in attendance, who represented most of the states. The Fifteenth Annual Meeting of the Workshop on Transportation Law will be held at the Warwick Hotel in New Orleans, July 25-29, 1976.

The members of the Legal Resources Group have been closely identified with the publication of a 3-volume treatise entitled, Selected Studies in Highway Law. The first 2 volumes were published during the

Organization of Group 3—Operation and Maintenance of Transportation Facilities.



past year. All papers but one have been completed for the third volume, and this volume is expected to be published in the spring of 1977. This work was carried out as part of Project 20-6 administered by the National Cooperative Highway Research Program. The first 2 volumes deal largely with eminent domain, and the third volume will cover highway contract law, environmental law as affecting highways, tort liability of state highway departments and their officers and employees, and intergovernmental relations. These 3 volumes will constitute the first multivolume work in American legal literature that deals exclusively with highway law.

Appreciation is expressed to Joseph M. Montano, the outgoing chairman of the Legal Resources Group Council, who had served since 1973.

SPECIAL COMMITTEE ON PUBLIC INFORMATION

H. Lincoln Harner, chairman

The Special Committee on Public Information serves in an advisory capacity to ensure that information about the board's activities is brought to the attention of the public and also to those directly interested in highway and public transportation research. The committee consists of 18 experienced public information and public relations specialists in the field of transportation and related subjects. They are charged with solving specific problems that arise from time to time in implementing the board's public information program.

Before the Annual Meeting, committee members prepared news releases that were available at the Annual Meeting, and members also staffed the press room during the meeting.

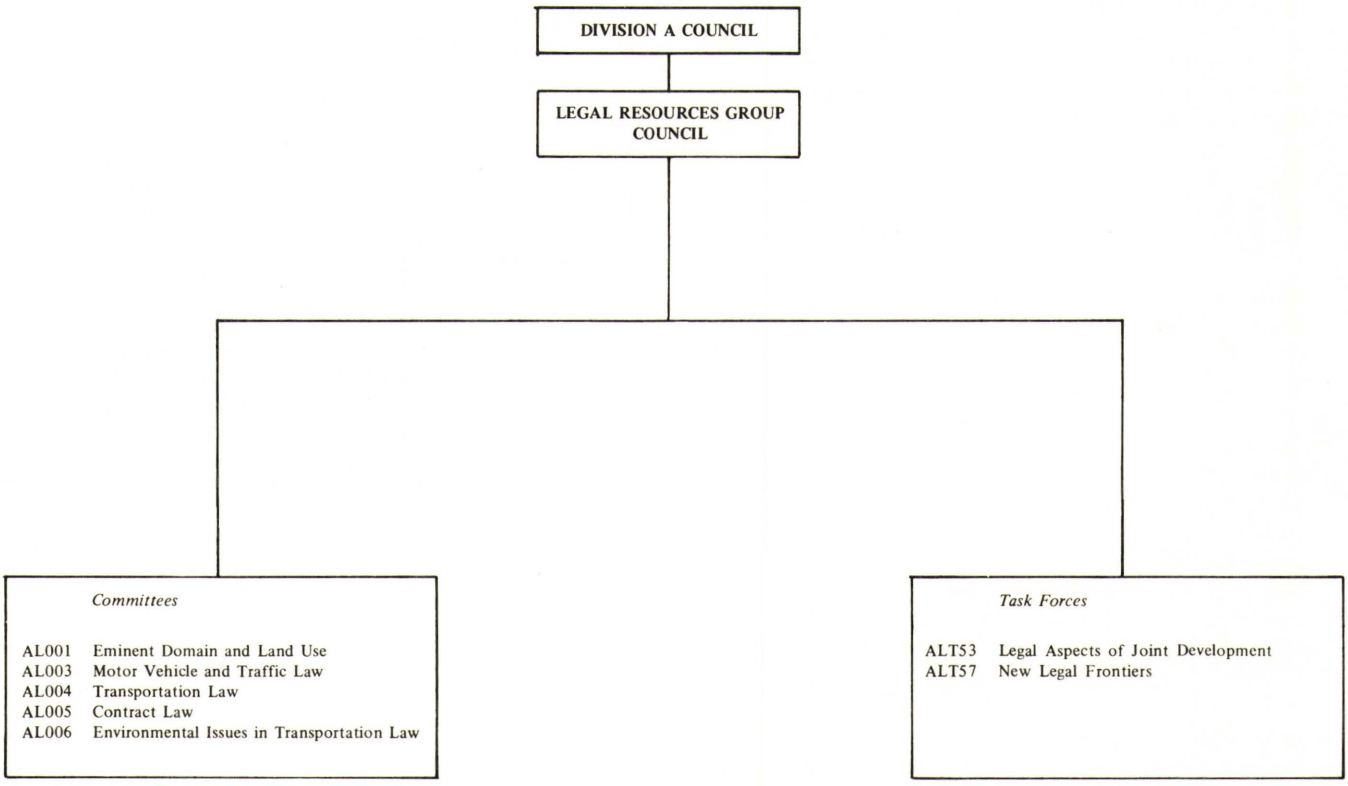
The *Transportation Research News* was continued through 1975 as a quarterly publication under the revised magazine-style format. With the beginning of 1976, the news was consolidated with *Transportation Research Abstracts* as a bimonthly publication retaining the name and format of the news.

SPECIAL COMMITTEE ON RAIL TRANSPORT ACTIVITIES

William J. Harris, Jr., chairman

The Special Committee on Rail Transport Activities of the Transportation Research Board was established at the direction of the Executive Committee in mid-1974 to recommend to the Executive Committee what activities the board should undertake in the area of rail transport. With the completion of deliberations and submission of its final report to the Executive Committee, which was approved in December 1975, the committee has completed its first task. The final report recommended new TRB activities in 12 railroad-related areas and recommended appointment of railroad personnel

Organization of Legal Resources Group.



to certain TRB standing committees.

The Special Committee was reappointed for another 2-year period, through January 1978, to monitor the implementation of its recommendations by various elements of the board, to give counsel as needed, and to advise the board in its search for increased financial support for this broader range of activities.

At one of its early meetings, the Special Committee on Rail Transport Activities recommended that TRB take immediate action in the area of railroad research needs and priorities. An Advisory Committee on the Railroad Research Study was appointed, and, with the financial support of the Federal Railroad Administration and of the Association of American Railroads, TRB undertook the Railroad Research Study. A major part of this study was a 4-week conference at Woods Hole, Massachusetts, during July 1975 to provide input from the railroad community on railroad research needs and priorities for the next 10 to 15 years. Approximately 175 people from railroads, government agencies, railway supply companies, consulting firms, and universities participated in this conference. *The Railroad Research Study Background Papers,* a bound volume containing the 75 papers from the conference, was published in January 1976. The final report of the study is to be published later.

As a result of the report of the Special Committee on Rail Transport Activities, Group 1 is in the process of forming the Committee on the Role of State Departments of Transportation in Rail Transport, the Committee on Surface Transport Regulation, and the Task Force on Intermodal Freight Transport. Group 2 has formed a new section, Railway Systems, and 2 new committees, Track Structure System Design and Electrification Systems. Group 2 has also appointed railroad personnel to the following committees: General Structures, Steel Bridges, Concrete Bridges, and Dynamics and Field Testing of Bridges. Group 3 has appointed a railroad person to the Committee on Roadside Maintenance. Actions within the group councils may increase the number of railroad personnel appointed to standing committees and may result in other plans for railroad activities.

SPECIAL COMMITTEE ON AIR TRANSPORT ACTIVITIES

Ronald W. Pulling, chairman

The Special Committee on the Air Transport Activities of the Transportation Research Board was established at the direction of the Executive Committee to evaluate all existing TRB activities of potential interest to the air transport community and to make recommendations concerning the appropriate role of TRB in air transport. In January 1976, the committee completed a comprehensive status report and submitted it to the Executive Committee, which approved the report in principle, commended the committee for its work, and ratified the general scope and direction of the committee's effort. The committee expects to have its final report completed during the summer of 1976.

The committee found that the expansion of existing TRB committees by broadening their scopes and by adding knowledgeable aviation people is the best mechanism for integrating air transport into ongoing TRB programs. The committee also identified a number of aviation research areas in which new committees would be useful. An area of high priority is that of airport landside research. The Group 3 Council approved the committee's recommendation, and a committee on airport landside research is now being established.

FIFTY-FIFTH ANNUAL MEETING

A record 3876 of the world's leading highway and transportation researchers, engineers, educators, and administrators attended the Fifty-fifth Annual Meeting of the Transportation Research Board held January 19-23, 1976, at the Sheraton-Park and Shoreham Americana hotels in Washington.

Classification of Organization Represented	Number of Registrants
U.S. Department of Transportation	642
Other federal agencies	110
State highway and transportation departments	729
Other state agencies	51
Local governments	220
Foreign governments	71
Universities and colleges	731
Transportation agencies	95
Research institutes	101
Consultants	418
Foreign nongovernment organizations	108
Service organizations	29
Trade associations	111
Industry	384
Press	30
Other	46
Total	3876

MEETINGS, CONFERENCES, AND WORKSHOPS

In addition to the Annual Meeting, the board conducts conferences and workshops throughout the year. This activity has increased substantially in recent years. The conferences are held throughout the country and have, thus, invalidated one of the reasons for the TRB Summer Meeting—to provide opportunity for those who could not attend the Annual Meeting in Washington to participate in a board activity. Consequently, the Summer Meeting has been discontinued. During fiscal year 1976 the following conferences and workshops were held.

Workshop on Railroad Transportation Research Needs

NAS Summer Studies Center, Woods Hole, Massachusetts, June 30-August 1, 1975

The objective of this workshop was to assess the emerging role of the railroads, examine the social implications of railroad transportation in areas such as environmental protection and energy conservation, review the state of railroad research and problems in the railroad industry, and to assess railroad research needs and produce a document outlining railroad research needs and priorities for the next 5 to 10 years. Some 175 people attended the workshop, which was cosponsored by the Federal Railroad Administration and the Association of American Railroads.

Workshop on Maintenance Management

Showboat Hotel, Las Vegas, Nevada, July 7-9, 1975

This workshop was the third in a series, each devoted to specific aspects of the maintenance function. Subjects discussed included the organization of highway maintenance subdivisions, productivity standards, budgeting procedures, dissemination of maintenance research findings, measurement of workload, purpose and operating practices of special crews, and winter maintenance practices in the various states. The workshop was cosponsored by the Nevada Department of Highways and was supported by a registration fee of $35. There were 100 people in attendance.

Conference on Socioeconomic Experience Abroad

Statler Inn, Cornell University, Ithaca, New York, July 22-23, 1975

This conference examined foreign experiences regarding transportation and land use planning and related them to similar experiences in the United States. Presentations included impact zoning in Japan, Canada, and France; citizen participation in Canada; preserving neighborhood values in areas of high traffic volumes in England and the United States; alternative transportation and land use plans in Toronto; and goods movement regulation in Canada and Australia. The conference was sponsored by the Social, Economic, and Environmental Section of Group 1 and the School of Environment and Engineering, Cornell University. It was supported by a registration fee of $15 and 55 people attended. A proceedings has been published.

Fourteenth Annual Workshop on Transportation Law

Bahia Hotel, San Diego, California, July 27-31, 1975

This workshop included the presentation of papers, panel discussions, and courtroom demonstration programs involving transportation law problems. It was sponsored by TRB in cooperation with the California Department of Transportation and supported by a registration fee of $70. A report was published and distributed to the attendees and those within the Legal Resources Group. Eighty people attended.

Eighth Transportation Research Board Summer Meeting

University of Michigan Campus, Ann Arbor, Michigan, August 4-7, 1975

The program for this Summer Meeting featured new transportation developments, both components and systems, and their relationship to the transportation needs of society and to the total environment in which transportation will function. The meeting was held with the cooperation of the Michigan Department of State Highways and Transportation and the University of Michigan and was supported by a registration fee of $40 for those who preregistered and $50 for those registering during the meeting. There were 125 people in attendance.

Conference on Mass Transportation Management

Causeway Inn, Tampa Bay, Florida, August 12-15, 1975

The fourth in a series of joint midyear conferences was sponsored by the Public Transportation Section of Group 1 and had as its theme, Major Challenges to Mass Transportation Management: The National Mass Transportation Act of 1974. Eighty people attended. A set of the informal reports was compiled and distributed to the conference attendees and the Urban Mass Transportation Administration.

Workshop on Highway Noise Prediction Models

National Academy of Sciences, Washington, D.C., September 23-25, 1975

This workshop brought together knowledgeable and experienced workers in the area of highway traffic noise prediction. The objectives were to identify major problem areas and deficiencies relating to highway traffic noise prediction; explore and recommend projects for resolving those problems or eliminating those deficiencies; and lay the foundation for a single, universally accepted highway traffic noise prediction procedure. The workshop was sponsored by the Committee on Transportation-Related Noise and the Federal Highway Administration. Transportation Research Circular 175 contains the workshop proceedings. There were 45 people in attendance.

Conference on Strategies for Reducing Gasoline Consumption Through Improved Motor Vehicle Efficiency

National Academy of Sciences, Washington, D.C., October 7-8, 1975

Subjects covered in the conference were reduction of fuel consumption by technological improvements; market response; impact of alternative strategies such as rationing and vehicle taxes; and trade-offs between fuel efficiency and safety and environmental considerations. The conference was sponsored by the Committee on Energy Conservation and Transportation Demand, and a special report will be published. There were 45 people in attendance.

Study of State of the Art of Assessing Transportation-Related Air Quality Impacts

National Academy of Sciences, Washington, D.C., October 22-24, 1975

The objectives of this study were to collect, identify, and share experiences on project level air quality impacts and the state of the art of air quality predictions and to discuss ways to incorporate photochemical oxidant models into the planning process. The workshop was sponsored by the Federal Highway Administration, and the proceedings were published in Special Report 167. Ninety people attended.

Conference on Paratransit

Hospitality House, Williamsburg, Virginia, November 9-12, 1975

This conference included both workshop sessions and formal meetings within the area of the integration of regular transit and paratransit operations in a unified mass transportation system; the use of paratransit for combined community level public transportation services (e.g., rush-hour feeder service to the line-haul commuter systems plus daytime jitney service and demand-responsive service plus late-hour and weekend taxi service); legal and regulatory changes needed to foster paratransit services; paratransit implementation in small towns and nonurbanized areas; role of state government; and new paratransit service concepts. The conference was sponsored by the Urban Mass Transportation Administration, and proceedings were published in Special Report 164. Approximately 120 people attended.

Workshop on Optimizing the Use of Materials and Energy in Transportation Construction

Allerton House, Monticello, Illinois, November 12-14, 1975

This 2-day workshop examined current practices that conserve energy and materials in construction, suggested innovative practices in construction and materials technology, and delineated research needs in these areas. The workshop also presented standards for construction materials that would be energy conserving in their manufacture and use. There were 53 people in attendance. The workshop was sponsored by the Federal Highway Administration, the Energy Research and Development Administration, and the Federal Energy Administration. Special Report 166 contains the proceedings.

Symposium on Joint Development Planning Activity in Baltimore for Highways and Transit

Maryland Department of Transportation, Baltimore, Maryland, December 1-2, 1975

This was a joint symposium with the Maryland Department of Transportation and the city of Baltimore on current highway and joint development plans for the area. Sixty participants from the region, including District of Columbia, Virginia, Pennsylvania, and Maryland, attended.

Conference on Improving the Quality and Quantity of Transportation for the Elderly and Handicapped

Sheraton Olympic Villas, Orlando, Florida, December 10-12, 1975

The purpose of this conference was to gather, review, and and disseminate information on recent transportation developments related to special-purpose systems for the elderly and handicapped in rural and urban areas. The 3-day meeting dealt with recent legislation, governmental hearings and action, innovative operating experiences, and research and field demonstrations related to enhancing the mobility of the elderly, the handicapped, and other transportation disadvantaged in the United States. The conference was sponsored by the Florida State University and cosponsored by the Committee on Transportation for the Disadvantaged. Approximately 200 people attended.

Ninth Annual Workshop on Human Factors in Transportation

Sheraton-Park Hotel, Washington, D.C., January 18, 1976

The ninth in this popular series of workshops again provided an opportunity for exchange of information between researchers and practitioners in the transportation field with particular emphasis on human factors. Six concurrent sessions were selected from a candidate list of 24. The workshop was sponsored jointly by the Committee on Motorist Information Systems and the Committee on Road User Characteristics and was supported by a registration fee of $35. Approximately 125 people attended.

Workshop on Urban Transportation Pricing Alternatives

Tidewater Inn, Easton, Maryland, March 14-17, 1976

This workshop addressed the pricing alternatives for urban transportation services and considered objectives of pricing policies, equity, spatial and temporal aspects, institutional questions, ways for reducing vehicle miles, public attitudes, and revenues and patronage effects. Attendance was limited to 35.

Second National Forum on Traffic Records Systems

Chase Park Plaza Hotel, St. Louis, Missouri, March 15-18, 1976

The forum was conducted by the National Safety Council Traffic Records Committee in cooperation with the TRB Committee on Traffic Records, the American Association of Motor Vehicle Administrators, and the National Conference on Governor's Highway Safety Representatives. Topics included new technology in identifying highway site locations, measures of exposure, integration of traffic records systems, and analysis of traffic records. The forum was supported by a registration fee, and the National Safety Council will publish the proceedings. Approximately 150 people attended.

Sixth Annual International Conference on Demand-Responsive Transportation and Other Paratransit Services

Sheraton-Park Hotel, Washington, D.C., March 15-17, 1976

The sixth conference in this series reviewed ongoing programs in various parts of the United States and foreign countries. It was sponsored by the Committee on Urban Transportation Service Innovations with the cooperation of the American Public Transit Association, the Federal Energy Administration, the International Taxicab Association, Massachusetts Institute of Technology, and the Urban Mass Transportation Administration. The conference was supported by a registration fee of $70 for those preregistered and $75 for those registering during the meeting. A special report will be published. Approximately 300 people attended.

Conference on Evaluation of Urban Transportation Alternatives

Hunt Valley Inn, Hunt Valley, Maryland, March 29-April 1, 1976

This is the second conference on this subject to be held by TRB at the request of the Urban Mass Transportation Administration. The purpose of the conference was to review and develop methods, strategies, and technical guidelines for evaluating urban transportation alternatives. Major emphasis was placed on reviewing the methods and techniques that have been proposed by UMTA as technical guidelines. Primary consideration was given to analyzing appropriate technical criteria and measures to evaluate transportation alternatives. This was an invitational conference with an attendance of 120.

Conference on Rural Public Transportation

Holiday Inn, Four Seasons, Greensboro, North Carolina, June 6-9, 1976

This conference was designed to provide assistance to local planners and operators, to disseminate information on the current status of rural transit systems, and to present results of ongoing research. The conference was sponsored by the Transportation Institute, North Carolina A&T State University, with the cooperation of the TRB Committee on Transportation for the Disadvantaged at the request of the Office of University Research of the U.S. Department of Transportation. Approximately 150 people attended.

SPECIAL TECHNICAL ACTIVITIES

The Special Technical Activities Division (Division B) administers and sometimes conducts projects that are funded outside the regular operating budget of the board. It also manages the development and operation of transportation research information services. In the board's organization this division receives guidance from the 10-member Division B Steering Committee, chaired by Harmer E. Davis. A given TRB activity may be designated as a special project essentially by 3 routes:

1. By agreement between TRB and another National Academy of Sciences unit that has been asked to carry out the special study (a 1969 project on ambulance design criteria conducted in cooperation with the Division of Medical Sciences is an example);
2. Through TRB cooperation with sponsors, including NCHRP, of projects that require unique TRB capabilities but that are not appropriate to the Regular Technical Activities Division (a 1967 highway litter study and an NCHRP project on economic consequences of highway improvements are examples); and
3. Through TRB solicitation of sponsorship, including NCHRP, for a project whose output will be directly applicable to the board's overall objectives (the TRIS project and NCHRP Project 20-5 are current examples).

In accordance with the policy of the National Academy of Sciences, an advisory committee of appropriate experts may be formed to give advice and counsel on the conduct of a special project. Staff as needed are employed for each project, and other designated members of the TRB staff may serve as technical advisors.

In fiscal year 1976, the work of Division B included 7 activities that are discussed and summarized below.

SYNTHESIS OF EXISTING INFORMATION RELATING TO HIGHWAY PROBLEMS

The objectives of this NCHRP project are to bring together research results, published material, and current practices on relatively narrow highway topics. Technical panels and consultants assist the project staff in acquiring, evaluating, and organizing the material on each topic into a *Synthesis of Highway Practice.*

Reports on the following 8 topics were completed in fiscal year 1976: highway tunnel operations, effects of studded tires, acquisition and use of geotechnical information, policies for accommodation of utilities on highway rights-of-way, design and control of freeway off-ramp terminals, durability of drainage pipes, instrumentation and equipment for testing highway materials, products

SUMMARY OF SPECIAL TECHNICAL ACTIVITIES DURING FISCAL YEAR 1976

Projects and Operations	Started	End of Current Contract	Advisory Committee	Principals	Sponsors	Current Year Funds (dollars)
Synthesis of Existing Information Relating to Highway Problems	12-67	Open	R. Biege, Jr.	T. Copas H. Pennock	NCHRP	300 000
Right-of-Way and Legal Problems	11-68	Open	S. Corwin	J. Vance	NCHRP	50 000
Operation of Highway Research Information Service	6-67	6-76		A. Mobley	States FHWA	500 000
Operation of Highway Safety Information Service	4-70	4-76		S. Schofer R. Damon	NHTSA	12 500
Operation of Maritime Research Information Service	6-69	6-76	R. Taggart	H. Paige[a] D. Mellor[a] S. Schofer[b]	MARAD	145 000[a] 68 600[b]
Operation of Railroad Research Information Service	3-72	9-76		F. Houser	FRA	250 000
National Network of Transportation Research Information Services	10-72	7-76	E. Mueller	P. Irick E. Pascal	US DOT	110 000

[a]Maritime Transportation Research Board. [b]Transportation Research Board.

and performance, and lime-fly ash stabilized bases and subbases.

Reports on the following 8 topics are in the final stages of completion: design of pile foundations; effect of weather on highway construction; statistically oriented end result specifications; transportation requirements for the handicapped, the elderly, and the economically disadvantaged; bridge bearings; staffing and management required for social, economic, and environmental impact assessments; recording and reporting methods for highway maintenance expenditures; and energy effects, efficiencies, and prospects for various modes of transportation.

An additional 12 topics are under way that deal with rapid-setting materials for patching of concrete, consolidation of concrete (emphasis on pavements and bridge decks), rehabilitation of portland cement concrete pavement joints, priority programming and project selection, effect of bridge painting practices on the environment, bus transit service planning guides (routes and schedules), recycling materials for highways, construction contract staffing, design and use of highway shoulders, safe conduct of traffic through highway construction and maintenance zones, precast concrete elements for transportation facilities, and guidelines for state highway and transportation data storage and retrieval systems.

RIGHT-OF-WAY AND LEGAL PROBLEMS

The first 2 volumes of *Selected Studies of Highway Law* were published. During fiscal year 1976 considerable progress was made on the research and writing of the following papers that will be included in the last volume of 3 volumes on highway law: Prequalification and Licensing of Bidders; Conflict of Interest; Competitive Bidding; Indemnification and Suretyship; Labor Relations; Effect of Mistakes in Bids, Plans, and Specifications; Changes, Changed Conditions, and Dispute Clauses; Legal Effect of Representations as to Subsurface Conditions; Contract Completion Time: Damages for Delay, Liquidated Damages, and Work Stoppage Under Work Order; Administrative Settlement and Disposition of Claims; Trial Strategy and Techniques in Contract Litigation; Environmental Litigation: Rights and Remedies; Trial Strategy and Techniques in Environmental Litigation; Liability of State Highway and Transportation Departments for Design and Maintenance Defects; Personal Liability of State Highway and Transportation Department Officers and Employees; and Legal Interrelationships of the Federal and State Governments.

HIGHWAY RESEARCH INFORMATION SERVICE

Use of the Highway Research Information Service (HRIS) by the state highway and transportation departments and the Federal Highway Administration was steady during fiscal year 1976. The number of requests from sponsors for specific batch-mode file searches of the HRIS storehouse was again 665. In addition, an average of 46 sponsors requested more than 7 of the 10 TRB-selected HRIS responses offered each month to all 53 sponsors.

HRIS continued magnetic tape exchange of highway transportation research information with the U.K. Transport and Road Research Laboratory, the English-language center for the International Road Research Documentation (IRRD) scheme. Each month nearly 200 IRRD selections of abstracts of non-U.S. published works and summaries of non-U.S. ongoing research projects are made available to HRIS on communications format tapes, the medium used for international exchange of transportation research information. Magnetic tape is also used to exchange ongoing highway transportation research project information with the Smithsonian Science Information Exchange (SSIE). The SSIE information exchange tape adds about 150 summaries of U.S. ongoing research projects to the HRIS file each quarter.

The HRIS file now contains more than 72 000 references, including 13 000 to ongoing research and 59 000 to published documents. About 40 percent of the HRIS document records are from sources in 72 foreign countries.

The eighth and final annual issue of *Highway Research in Progress* was published. This 870-page book contained 3375 summaries of ongoing research projects being conducted in the United States. Citations to the summaries of the ongoing research projects in the United States are also listed in the 1975 *World Survey of Current Research and Development on Roads and Road Transport,* published annually by the International Road Federation (IRF). Future issues of the IRF world survey publication will contain listings of the summaries of the U.S. ongoing research projects that are stored on the computer magnetic tape files of HRIS. Four quarterly issues of *HRIS Abstracts* were published. They contained approximately 4260 abstracts of published technical papers, research reports, journal articles, and bibliographies stored on the HRIS magnetic tape files during the year.

HRIS provided the Roads and Transportation Association of Canada with a camera-ready printout of 382 summaries of ongoing research projects in Canada for publication in its 1976 report.

This fiscal year HRIS continued to offer on-line retrieval service to the U.S. transportation community through participation in the evolving National Network of Transportation Research Information Services (TRISNET).

The HRIS on-line file consists of 4680 summaries of ongoing research projects that include all the summaries published in *Highway Research In Progress,* No. 8, 1975, and 1305 summaries of non-U.S. highway research projects, selected by the International Road Federation from its 1974 world survey and considered to be of especial interest to the highway transportation research community in the United States, and also includes 13 370 abstracts published in *HRIS Abstracts,* June 1970 through December 1974. The 18 050 HRIS selections in the on-line file of the TRIS on-line data base represent about 25 percent of the total HRIS storehouse.

HIGHWAY SAFETY INFORMATION SERVICE

In the Highway Safety Information Service (HSIS) proj-

ect, TRB assisted the National Highway Traffic Safety Administration in creating and maintaining a computer file of highway safety literature abstracts. At the present time this file contains more than 17 000 abstracts that have been published by NHTSA since 1968. The records are in the TRIS on-line data base. Work on this project was terminated in April 1976.

MARITIME RESEARCH INFORMATION SERVICE

The Maritime Research Information Service (MRIS) project is sponsored by the Maritime Administration and is conducted by TRB with advice from the Maritime Information Committee of the Maritime Transportation Research Board, National Research Council. The semiannual *MRIS Abstracts* and monthly *Current Awareness Service* for the maritime industry were published in fiscal year 1975. The MRIS file now contains 11 000 records, and approximately 1500 of these are stored in the TRISNET on-line data base.

RAILROAD RESEARCH INFORMATION SERVICE

The Railroad Research Information Service (RRIS) was developed to serve the Federal Railroad Administration and the railroad community at large. It has been fully operational for 3 years. The RRIS file contains more than 11 000 summaries of research projects and abstracts of reports and articles. The Autumn 1975 and Spring 1976 issues of the *Railroad Research Bulletin* and a 1973-1975 *Cumulative Index* were published and distributed. The volume of retrievals has been substantially higher in fiscal year 1976 than in previous years. Approximately 5000 RRIS references are in the TRIS on-line data base.

NATIONAL NETWORK OF TRANSPORTATION RESEARCH INFORMATION SERVICES

TRB provides a Communications and Coordination Center (CCC) for The National Network of Transportation Research Information Services (TRISNET). The CCC is composed of the TRISNET Committee, the Managers Council, and the Secretariat.

In fiscal year 1976 the TRISNET Committee developed advisory reports on 5 issues: international flows of transportation information, user charge policies, institutional alternatives for TRISNET, evaluation of network services and products, and milestones for TRISNET development. The Managers Council worked in 2 specific areas: classification of transportation information and development of a document delivery service. The Secretariat provides staff services to the committee and council and is a focal point for communications with network elements and other information centers. During fiscal year 1976 the Secretariat published *TRISNET News* on a quarterly basis and published the *Directory to Transportation Research Information Services.*

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

With the close of fiscal year 1976, the National Cooperative Highway Research Program completed its fourteenth year as the principal mechanism for providing the state highway and transportation departments with a long-range program of systematic, well-designed, applied research on the many nationwide problems facing administrators and engineers.

The NCHRP concept of operation has proved to be effective in solving the increasingly complex problems arising from the need for efficient, economical, and safer highway transportation and for meshing highway transportation with other modes and with other societal concerns. Not only has NCHRP research provided practical solutions for pressing highway and urban transportation problems but it also has provided an extensive reservoir of technical information that is being used in the development of practical solutions for all ranges of problems being worked on by other agencies.

Through activities of the Organisation for Economic Co-operation and Development, the NCHRP research results have made effective contributions to road research and better transportation systems throughout the world. Because of the program's demonstrated successes, several foreign organizations have investigated the NCHRP operation to determine the suitability of similar programs in their own environments.

The NCHRP was established in 1962 to provide a continuing program of highway research. It is sponsored by participating member departments of the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration of the U.S. Department of Transportation and is carried out under a 3-way agreement among these 2 agencies and the National Academy of Sciences.

Each state annually contracts with the academy to commit 4½ percent of its 1½ percent federal-aid highway planning and research funds. From these contributions, a cooperative pool of about $3.5 million is made available for NCHRP's contract research and for its administrative and technical operation.

AASHTO annually proposes research problems for inclusion in the NCHRP fiscal-year activities. At least two-thirds of the participating member departments must approve the research problems and agree to their financial support before they can be brought into the program. After the balloting by member departments, the approved problems are reviewed by the NCHRP Advisory Committee as to acceptability for administration by the academy through the Transportation Research Board.

Once accepted, the problems making up each program are assigned to panels that advise on the technical aspects. There are at present some 569 members on these panels representing the District of Columbia, Canada, and 83 percent of the states. They analyze the problems, outline particular projects and their objectives, and prepare research project statements by which proposals are solicited from qualified private and public research agencies. They review the proposals, recommend contract awards, and provide counsel to the NCHRP staff responsible for surveillance of work under the research contracts. Finally, they review reports for acceptability and for accomplishment of the approved research plan.

Through fiscal year 1976, these activities have resulted in the development of 252 research projects for which 285 contracts have been executed at a total funding level of some $34.5 million. The subject matter of the projects ranges across the full spectrum of concern within the transportation field and evidences the sponsors' immediate interest in acquiring early answers to their many problems. The contracts have been let to agencies headquartered in the District of Columbia and more than half of the states. Universities have received about 37 percent of the contracts; research institutes 21 percent; industry, consultants, and trade associations 38 percent; professional societies and service organizations 2 percent; and state highway and transportation departments and other transportation or governmental agencies 2 percent.

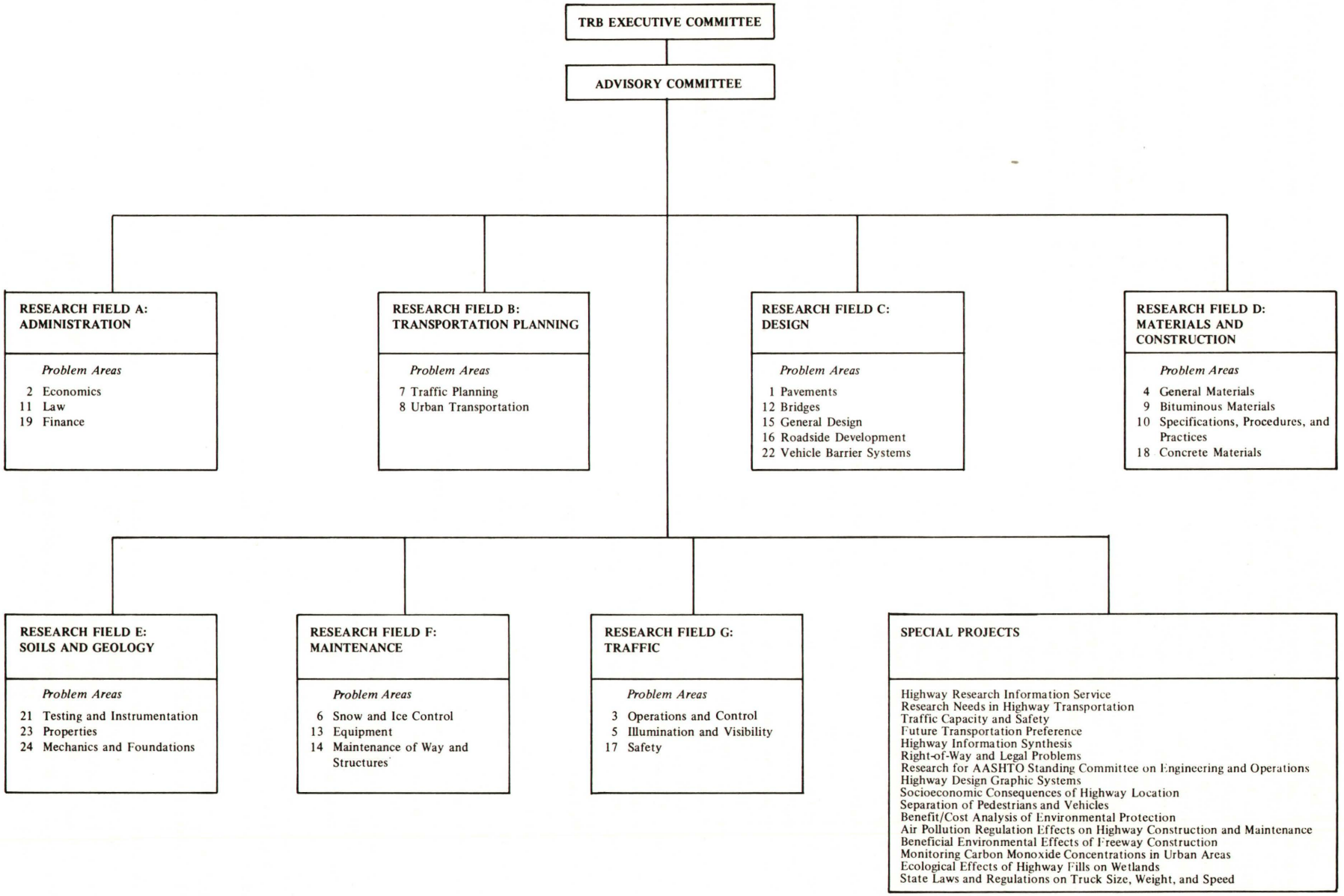
Official referral to the academy of the fiscal year 1977 program—the fifteenth program of research problems for the NCHRP—is expected in the fall of 1976. This program, tentatively funded at $2.9 million for research, consists of 9 continuation projects and 11 new contracts. A list of the projects is given below. It is estimated that research on this program will begin in late 1976.

A professional staff assigned to NCHRP by the board includes project engineers who have experience and training appropriate to administrative and technical surveillance of the research. The engineers review quarterly progress reports and monthly progress schedules, maintain telephone contacts, visit the assigned projects throughout their contract periods, and discuss the projects with the principal investigators to learn whether the research is being pursued in line with the approved research plans.

Meetings involving the staff, advisory panels, and agency personnel are held frequently to review progress and provide guidance for continuing work. Thirty-four such meetings were held in fiscal year 1976. The project engineers and the advisory panels evaluate the completed research to determine the degree of technical compliance with the contracts and the acceptability of the final reports to the board and the academy.

The work of the NCHRP is manifested principally through its publications. Research findings are published

Organization of National Cooperative Highway Research Program.



in a regular NCHRP report series according to publication priorities based on the usefulness of the results to the sponsors. All possible means of reporting are used to get results in the hands of the potential users as quickly as possible. Each highway administrator receives a copy immediately on publication, and some 4000 copies are formally distributed through the Transportation Research Board's selective distribution system.

Thus far, 321 report drafts (interim or final) have been received from research contractors and have resulted in 206 regular NCHRP reports. Twenty project reports have not been published but, according to usual practice, were summarized in the program's annual *Summary of Progress.* The remaining report drafts are either in the acceptance review of publication process or have been relegated to the unpublished category. A list of the reports issued this year is given below.

Another means for bringing research findings before practicing engineers is the *NCHRP Research Results Digest,* a series of flyers published at frequent intervals to provide an early awareness of research results emanating from the various projects. Making these results known as they are developed and before they are published in final reports encourages early application.

Semiannual progress reports were submitted by NCHRP to the sponsors to keep them informed of the status of each project in the program. An important feature of these progress reports is the documentation of known uses of NCHRP results, plus any known cost savings, so that all states may be aware of the practical applications. Considerable feedback from the states documents the value and use of many of the research products.

During fiscal year 1976, an AASHTO-appointed monitoring committee met with board staff to review all aspects of NCHRP operation and concluded that progress was satisfactory.

The NCHRP is a unique contract research effort designed to respond quickly and efficiently to the needs of the state highway and transportation departments through solution of pressing transportation problems. Although the Transportation Research Board administers the program, the research content is solely the prerogative of the American Association of State Highway and Transportation Officials and the participating member state highway and transportation departments. The program is one of applied rather than basic research, and every effort is made to help administrators use the research findings. Although NCHRP research is sponsored by AASHTO, design and operation of the program are such that the findings can also be used by other agencies.

PUBLICATIONS RELEASED DURING FISCAL YEAR 1976

Selection of Safe Roadside Cross Sections, Report 158
Weaving Areas–Design and Analysis, Report 159
Flexible Pavement Design and Management–Systems Approach Implementation, Report 160
Systems Approach to Pavement Design–Implementation Phase, Appendices B, C, G, H, Supplement to Report 160
Techniques for Reducing Roadway Occupancy During Routine Maintenance Activities, Report 161
Methods for Evaluating Highway Safety Improvements, Report 162
Design of Bent Caps for Concrete Box-Girder Bridges, Report 163
Fatigue Strength of High-Yield Reinforcing Bars, Report 164
Waterproof Membranes for Protection of Concrete Bridge Decks–Laboratory Phase, Report 165
Waste Materials as Potential Replacements for Highway Aggregates, Report 166
Transportation Planning for Small Urban Areas, Report 167

Bituminous Emulsions for Highway Pavements, Synthesis of Highway Practice 30
Highway Tunnel Operations, Synthesis of Highway Practice 31
Effects of Studded Tires, Synthesis of Highway Practice 32
Acquisition and Use of Geotechnical Information, Synthesis of Highway Practice 33
Policies Accommodation of Utilities on Highway Rights-of-Way, Synthesis of Highway Practice 34
Design and Control of Freeway Off-Ramp Terminals, Synthesis of Highway Practice 35
Instrumentation and Equipment for Testing Highway Materials, Products, and Performance, Synthesis of Highway Practice 36

TENTATIVE AND CONTINUING RESEARCH PROJECTS FOR FISCAL YEAR 1977

Project	Allotted Amount (dollars)
Tentative Projects	
AREA 1: Design–Pavements	
Project 1-17: Guidelines for Recycling Pavement Materials	200 000
AREA 3: Traffic–Operations and Control	
Project 3-26: Investigation of Selected Noise Barrier Acoustical Parameters	75 000
Project 3-27: Guidelines for Selecting Traffic Signal Control at Individual Intersections	150 000
AREA 4: Materials and Construction–General Materials	
Project 4-12: Upgrading of Poor or Marginal Aggregates for PCC and Bituminous Pavements	150 000
Project 4-13: Temporary Pavement Marking Systems	100 000

AREA 8: Transportation Planning–Urban Transportation	
Project 8-19: The Relationship of Changes in Urban Highway Supply to Vehicle-Miles of Travel	200 000
AREA 10: Materials and Construction–Specifications, Procedures, and Practices	
Project 10-11: Development of a Performance Specification for Bridge Deck Joint-Sealing Systems	30 000
AREA 12: Design–Bridges	
Project 12-17: Evaluation of Repair Techniques for Damaged Steel Bridge Members	50 000
AREA 20: Special Projects	
Project 20-14: Monitoring Carbon Monoxide Concentrations in Urban Areas	100 000
Project 20-15: Ecological Effects of Highway Fills on Wetlands	150 000
Project 20-16: State Laws and Regulations on Truck Size, Weight, and Speed	150 000
AREA 22: Design–Vehicle Barrier Systems	
Project 22-2(2): Lower Service Level Highway Railings–Performance and Design Criteria	195 000
Subtotal	1 550 000

Continuing Projects

AREA 1: Design–Pavements	
Project 1-10B: Development of Pavement Structural Subsystems	150 000
AREA 3: Traffic–Operations and Control	
Project 3-21: Motorist Response to Highway Guide Signing	150 000
Project 3-22: Guidelines for Design and Operation of Ramp Control Systems	250 000
AREA 8: Transportation Planning–Urban Transportation	
Project 8-11: Social, Economic, Environmental Consequences of Not Constructing a Transportation Facility	100 000
Project 8-13: Disaggregate Travel Demand Models	200 000
Project 8-14: New Approaches to Understanding Travel Behavior	150 000
AREA 20: Special Projects	
Project 20-5: Synthesis of Information Related to Highway Problems	300 000
Project 20-6: Right-of-Way and Legal Problems Arising Out of Highway Programs	75 000
Project 20-7: Research for AASHTO Standing Committee on Engineering and Operations	100 000
Subtotal	1 475 000
Total	3 025 000

ADMINISTRATION

The administrative activities of the Transportation Research Board are located in Division C and are the responsibility of the assistant director for administration. Division C is responsible for the preparation and control of budgets for all Transportation Research Board activities and for management of Transportation Research Board accounts. It maintains liaison with the comptroller of the National Academy of Sciences, the Office of the Business Manager, and the Personnel Office.

Further responsibilities of the division include personnel administration, editing and printing of TRB publications and their sale and distribution, physical arrangements and management of meetings, membership records and accounts, procurement, and general office services.

PUBLICATION PROGRAM

The Transportation Research Board has gained an enviable reputation as an agency that consistently reports useful results based on transportation research conducted in the United States and in other countries. The board's ambitious publications program is the primary mechanism for getting this information to those who can best use it. A summary of the publications is given below. In addition to the publications given in this tabulation, programs for the Annual Meeting and the conferences and workshops, newsletters, membership and author information booklets, and other miscellaneous material were published.

Papers originally presented at TRB annual meetings and accepted for publication after stringent review generally appear in the Transportation Research Record series. Reports of research in which the TRB staff or committees actively participate are published in the Special Report series.

Research conducted through the National Cooperative Highway Research Program is reported in 3 series: the NCHRP Reports, the Research Results Digest, and the Synthesis of Highway Practice.

In January 1976, the widely read monthly *Transportation Research Abstracts* was merged with the *Transportation Research News,* which is now published bimonthly. A special section in each issue of

SUMMARY OF PUBLICATION PROGRAM FOR FISCAL YEAR 1976

Series or Type	Volumes and Numbers	Individual Publications	Incorporated Papers or Reports	Pages	List Price (dollars)
Transportation Research Abstracts	Vol. 45, Nos. 7 to 12	6	326[a]	224	6.00
Special Report	Nos. 152 to 167	15	284	2 700	124.45
Transportation Research Circular	Nos. 169 to 175	7	7	234	12.00
Transportation Research News	Nos. 59 to 64	6	151[a]	240	12.00
Transportation Research Record	Nos. 532 to 573	42	304	3 584	179.60
NCHRP Report	Nos. 155 to 167	13	14	1 544	78.80
NCHRP Synthesis of Highway Practice	Nos. 27 to 36	10	19	580	38.40
NCHRP Research Results Digest	Nos. 73 to 88	16	16	252	16.00
HRIS Abstracts	Sept./Dec. 1975 March/June 1976	4	4273[a]	743	25.00
Highway Research in Progress	No. 8	1	3376[b]	884	40.00
Directory	1975	1	1	432	10.00
Index to Abstracts	1975	1	1	36	4.00
RRIS Bulletin	Vol. 2, No. 2 Vol. 3, No. 1 Index 1973 to 1975	3	3	1 350	30.00
		125	8955	12 803	576.25

[a]Brief abstracts of full reports contained.

[b]Brief description of ongoing research projects.

Transportation Research News contains abstracts of about 50 important items. The works of special committees are often disseminated through the Transportation Research Circular series. In addition, the board published a bibliography series, indexes to TRB publications, and, as output from its information services, a quarterly Highway Research Information Service Abstracts, and a biannual Railroad Research Information Service Bulletin.

Through a system of selective distribution, subscribers may elect to receive TRB publications in 36 subject areas. During fiscal year 1976, more than 505,000 copies of these publications were distributed to supporting members of the board in the United States and in some 85 foreign countries.

Most TRB publications are furnished to regular board sponsors as one of the services rendered in consideration of their support, but over-the-counter sales to interested individuals and to booksellers also contribute to wide circulation.

SUPPORTING MEMBERS

The Transportation Research Board is supported principally by the state highway and transportation departments, the Federal Highway Administration, and the Urban Mass Transportation Administration. In addition, organizations and individuals may become supporting members of the board.

Organizations may apply for membership in the Transportation Research Board if they are engaged in research related to transportation, if their activities are educational in character, or if they are interested in technical development relating to transportation within an industry or group of industries.

There are 2 classes of Organizational Supporting Membership: (a) governmental agencies and academic organizations and (b) private organizations. Within the former are government units, educational institutions, and professional societies. The latter class consists of service organizations, trade associations, industrial concerns, and consulting engineers. There are at the present time about 315 organizations affiliated with the board; of these about 46 percent are foreign governmental or foreign business organizations.

In addition to organizational members, the board invites applications for Individual Supporting Membership from persons interested in its activities and who desire to further the work of the board. There are 3 classes of Individual Supporting Membership: general, student, and academic. Special plans are offered to individual members who gear their membership fee to publications desired. At the present time there are more than 3000 Individual Supporting Members, made up of about 2300 general members, 300 student members, and 400 academic members.

SUSTAINING MEMBERS

In those cases in which the support furnished to the board is much greater than that necessary to pay for publications and information services, the organization or individual is considered a Sustaining Member. In addition to the 50 state highway and transportation departments, the District of Columbia and Puerto Rico, the Federal Highway Administration, and the Urban Mass Transportation Administration, 14 other organizations are classified as Sustaining Members. A list of representatives and alternate representatives of these organizations is given below.

State highway and transportation departments
Representatives listed under state and university representatives

Federal Highway Administration
Norbert T. Tiemann, representative

Urban Mass Transportation Administration
Robert E. Patricelli, representative

American Iron and Steel Institute
W. G. Kirkland, representative

Armco Steel Corporation
D. S. Wolford, representative
R. S. Standley, alternate

The Asphalt Institute
Vaughn Marker, representative
John M. Griffith, alternate

Associated General Contractors of America, Inc.
Roger D. Allan, representative

Chevron Asphalt Company
W. J. Kari, representative
M. V. Hunter, alternate

Dow Chemical Company
D. H. Moeller, representative
Harvey Shafer, alternate

Ford Motor Company
William A. McConnell, representative
Irving J. Rubin, alternate

General Motors Corporation
E. S. Starkman, representative
L. G. Lundstrom, alternate

Martin Marietta Corporation
D. B. Wendling, representative
M. H. Willis, Jr., alternate
J. R. Wilson, alternate

Mobil Research and Development Corporation
C. A. Pagen, representative
D. R. Cushman, alternate

3M Company
J. C. Landen, representative
John O. Elstad, alternate
Philip V. Palmquist, alternate
R. J. Peterson, alternate

Port Authority of New York and New Jersey
Edward S. Olcott, representative
Warren S. Quimby, alternate

Portland Cement Association
Gordon Ray, representative
E. C. Lokken, alternate

United States Steel Corporation
Richard S. Fountain, representative
L. N. Bigelow, alternate

STATE AND UNIVERSITY REPRESENTATIVES

Transportation Research Board representatives in state highway and transportation departments and educational institutions provide continuing liaison between their organizations and the Transportation Research Board. The TRB representatives actually function as an arm of the board. They help arrange the field visits made by the board's professional staff, work closely with the TRB staff in developing papers for the Annual Meeting and in finding qualified people to serve on TRB committees, keep their organizations informed about the latest activities of the board, and answer questions pertaining to any TRB service. The following persons were serving as TRB State and University Representatives as of June 1, 1976.

State Highway and Transportation Departments

Alabama
Frank L. Holman, Jr.
Alaska
Doyle W. Ross
Arizona
Gene R. Morris
Arkansas
Billy K. Cooper
California
D. G. Pengilly
Colorado
Glenn W. Fritts
Connecticut
Charles E. Dougan
Delaware
A. Barratt Cullen, Jr.
District of Columbia
Bernard J. O'Donnell
Florida
William Gartner, Jr.
Georgia
Hugh L. Tyner
Hawaii
Terry Aratani
Idaho
James W. Hill
Illinois
Donald R. Schwartz
Indiana
M. L. Hayes
Iowa
Stephen E. Roberts
Kansas
John D. McNeal
Kentucky
W. B. Drake
Louisiana
E. J. Breckwoldt
Maine
Richard A. Luettich
Maryland
Nathan L. Smith, Jr.
Clyde E. Pyers
Massachusetts
Thomas F. Humphrey
Michigan
Kent A. Allemeier
Minnesota
Frederick W. Thorstenson
Mississippi
T. C. Paul Teng
Missouri
William L. Trimm
Montana
Arthur Braut
Nebraska
Derald S. Kohles
Nevada
George B. Westenhoefer
New Hampshire
Philip E. McIntyre
New Jersey
Eugene F. Reilly
New Mexico
Arthur G. DeLong
New York
William P. Hofmann
North Carolina
W. F. Caddell, Jr.
North Dakota
Robert T. Peterson
Ohio
Leon O. Talbert
Oklahoma
C. Dwight Hixon
Oregon
Fred B. Klaboe
Pennsylvania
Leo D. Sandvig
Rhode Island
Francis H. Dutra
South Carolina
Oren S. Fletcher
South Dakota
William T. Voss
Tennessee
Paul D. Edens
Texas
Robert L. Lewis
Utah
Dale E. Peterson
Vermont
Richard J. Nicholls
Virginia
Jack H. Dillard
Washington
Hollis R. Goff
West Virginia
George E. White, Jr.
Wisconsin
Karl H. Dunn
Wyoming
F. O. Witters
Puerto Rico
Roberto Lugo Torres

Academic Institutions

Alabama
Raymond K. Moore, Auburn University
E. P. Segner, Jr., University of Alabama
Alaska
George R. Knight, University of Alaska
Arizona
Judson S. Matthias, Arizona State University
Rudolf A. Jiminez, University of Arizona
Arkansas
E. Walter LeFevre, University of Arkansas
California
Ronald F. Scott, California Institute of Technology
Robert L. Alexander, California State University
John W. Comer, California State Polytechnic College
Thomas G. Schultz, San Jose State College
Vincent Roggeveen, Stanford University
P. K. Mehta, University of California, Berkeley
William L. Garrison, Institute of Transportation Studies, University of California, Berkeley
Tenny N. Lam, University of California, Davis
Harry W. Case, University of California, Los Angeles
Frederick L. McGuire, University of California, Irvine
Colorado
James G. Johnstone, Colorado School of Mines
Daryl B. Simons, Colorado State University
Vasant H. Surti, University of Colorado
Ralph E. Williams, University of Denver
Connecticut
Jack E. Stephens, University of Connecticut
Delaware
Conan P. Furber, University of Delaware
District of Columbia
Philip L. Brach, Catholic University of America
Delon Hampton, Howard University
Florida
Edward I. Isibor, Florida International University
Walter H. Zimpfer, University of Florida
W. J. Fogarty, University of Miami
Georgia
Paul H. Wright, Georgia Institute of Technology
Sid Davis, Atlanta University
Hawaii
Peter H. P. Ho, University of Hawaii

Idaho
Robert P. Lottman, University of Idaho
Illinois
J. E. Bowles, Bradley University
Donald S. Berry, Northwestern University
Moreland Herrin, University of Illinois
James E. Aaron, Southern Illinois University
Indiana
George M. Smerk, Indiana University
Harold L. Michael, Purdue University
Cecil T. Lobo, Rose-Hulman Institute of Technology
Don A. Linger, University of Notre Dame
Iowa
R. L. Carstens, Iowa State University of Science and Technology
John J. O'Mara, University of Iowa
Kenneth J. Dueker, Institute of Urban and Regional Research, University of Iowa
Kansas
Bob L. Smith, Kansas State University
Joe Lee, University of Kansas
Kentucky
John W. Hutchinson, University of Kentucky
Leslie H. Leach, Eastern Kentucky University
Louisiana
Olin K. Dart, Jr., Louisiana State University and Agricultural and Mechanical College
John L. Niklaus, Tulane University
William O. Hadley, Louisiana Technological University
Maine
George W. Greenwood, University of Maine
Maryland
Everett C. Carter, University of Maryland
Massachusetts
Daniel Brand, Harvard University
Daniel Roos, Massachusetts Institute of Technology
Vacant, Northeastern University
Christian F. Davis, Tufts University
Richard D. Desrosiers, Worcester Polytechnic Institute
Paul W. Shuldiner, University of Massachusetts
Michigan
Charles E. Cutts, Michigan State University
Warren J. Baker, University of Detroit
Eugene Y. Huang, Michigan Technological University
Donald E. Cleveland, University of Michigan
John H. Lamb, Wayne State University
Minnesota
Miles S. Kersten, University of Minnesota
Mississippi
R. M. Scholtes, Mississippi State University
Samuel L. DeLeeuw, University of Mississippi
Missouri
David L. Guell, University of Missouri at Columbia
Joseph H. Senne, University of Missouri at Rolla
Lonnie E. Haefner, Washington University
Robert Ulrich, Central Missouri State University
Montana
Alfred C. Scheer, Montana State University
John M. Stewart, University of Montana
Nebraska
Edward Robert Post, University of Nebraska
Nevada
Charles R. Breese, University of Nevada
New Hampshire
S. Russell Stearns, Dartmouth College
J. Harold Zoller, University of New Hampshire
New Jersey
Paul Michael Lion, Princeton University
Edward Nawy, Rutgers, State University of New Jersey
I. Robert Ehrlich, Stevens Institute of Technology
New Mexico
Samuel P. Maggard, New Mexico State University
Cornie L. Hulsbos, University of Mexico
New York
Ming L. Pei, City University of New York
Arthur L. Straub, Clarkson College of Technology
Gordon P. Fisher, Cornell University
Theodore F. Ehrlich, Manhattan College
Louis J. Pignataro, Polytechnic Institute of New York
Larry J. Feeser, Rensselaer Polytechnic Institute
Paul J. Brennan, Syracuse University
Ram K. Mittal, Union College
North Carolina
Aleksandar Sedmak Vesic, Duke University
W. G. Mullen, North Carolina State University at Raleigh
Gorman Gilbert, University of North Carolina
Arthur Saltzman, North Carolina A&T State University
North Dakota
James L. Jorgenson, North Dakota State University
Vacant, University of North Dakota
Ohio
George G. Goble, Case Western Reserve University
Clarence H. C. James, Cleveland State University
Robert H. Keyser, Ohio Northern University
Eldridge A. Whitehurst, Ohio State University
Edward G. Russ, Ohio University
David H. Timmerman, University of Akron
Robert T. Howe, University of Cincinnati
David C. Colony, University of Toledo
Oklahoma
Robert L. Janes, Oklahoma State University
Joakim G. Laguros, University of Oklahoma
Oregon
Robert Davis Layton, Oregon State University
Pennsylvania
Richard G. McGinnis, Bucknell University
John E. Tolle, Carnegie-Mellon University
Daniel R. Fredland, Drexel University
David A. Van Horn, Lehigh University
George N. Bathish, Widener College
William H. Gotolski, Pennsylvania State University
Joel I. Abrams, University of Pittsburgh
Vukan R. Vuchic, University of Pennsylvania
Richard H. Miller, Villanova University
Rhode Island
Kendall Moultrop, University of Rhode Island
South Carolina
H. W. Busching, Clemson University
Robert R. Roberts, University of South Carolina

South Dakota
R. Norman Orava, South Dakota School of Mines and Technology
Emory E. Johnson, South Dakota State University
Norman Heimstra, University of South Dakota
Tennessee
Kenneth W. Heathington, University of Tennessee
Daniel M. Brown, Vanderbilt University
Frank M. Holloway, Tennessee Technological University
Texas
Cecil H. Smith, Southern Methodist University
Charles J. Keese, Texas A&M University
Joseph E. Minor, Texas Technological University
Kenneth J. Tharp, University of Houston
Clyde E. Lee, University of Texas at Austin
John J. Haynes, University of Texas at Arlington
Utah
W. Don Budge, Brigham Young University
Clifford G. Bryner, University of Utah
R. K. Watkins, Utah State University
Vermont
Kenneth M. Kidd, Norwich University
Joseph C. Oppenlander, University of Vermont
Virginia
Lester A. Hoel, University of Virginia
J. A. McDonough, Virginia Military Institute
Richard D. Walker, Virginia Polytechnic Institute and State University
Washington
Edgar M. Horwood, University of Washington
Elvin G. Ericson, Washington State University
West Virginia
Lyle K. Moulton, West Virginia University
Erkan Esmer, West Virginia Institute of Technology
Wisconsin
Jahanbakhsh Behnam, Marquette University
Herman A. J. Kuhn, University of Wisconsin–Madison
Edward Beimborn, University of Wisconsin–Milwaukee
James R. Levey, University of Wisconsin–Platteville
Wyoming
Donald R. Lamb, University of Wyoming
Puerto Rico
Jose Vega-Ortiz, University of Puerto Rico
Canada
J. J. Baker, University of Alberta
V. Setty Pendakur, University of British Columbia
Merritt M. David, University of Toronto
India
M. Anandakrishnan, India Institute of Technology Kanpur
O. P. Jain, University of Roorke
Japan
Masami Fukuoka, University of Tokyo
Lebanon
N. E. Manasseh, American University of Beirut
Mexico
Santiago Corro Caballero, University of Mexico
Philippines
P. C. Reyes, University of Philippines

SUMMARY FINANCIAL STATEMENT FOR FISCAL YEAR 1976

The following statement does not include fiscal information regarding the National Cooperative Highway Research Program or Special Projects, which were independently financed during fiscal year 1976.

Estimated income during fiscal year 1976		
Research Correlation Service (state highway and transportation departments)	$1 310 000	
Federal Highway Administration	445 000	
Urban Mass Transportation Administration	50 000	
Dues from supporting members	245 000	
Library subscriptions	53 000	
Publication sales	105 000	
Registration fees	41 000	
Highway Research Information Service	13 000	
Miscellaneous	11 000	
Funds carried forward from previous fiscal years	220 000	
Total		$2 493 000

Estimated expenses during fiscal year 1976		
Salaries	$1 242 000	
Travel	150 000	
Communications and shipping	55 000	
Services and supplies	80 000	
Data processing	70 000	
Printing and duplicating	250 000	
Indirect cost	646 000	
Total		$2 493 000

TRANSPORTATION RESEARCH BOARD
National Academy of Sciences
2101 Constitution Avenue, N.W., Washington, D.C. 20418

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