

TRANSPORTATION RESEARCH BOARD



2017 ANNUAL REPORT



The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. C. D. Mote, Jr., is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the National Academies of Sciences, Engineering, and Medicine to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at www.national-academies.org.

The **Transportation Research Board** is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to increase the benefits that transportation contributes to society by providing leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied committees, task forces, and panels annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at www.TRB.org.



INNOVATION AND PROGRESS THROUGH RESEARCH

OFTEN DESCRIBED AS THE lifeblood of the economy, a ubiquitous and well-functioning transportation system is essential to commerce and to the social connectivity and access to opportunity critical to improved quality of life. For nearly a century, the Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine has played a key role in developing a modern transportation system that better serves these functions through a range of convening, research, information-sharing, and advisory activities. Because of the rapid pace of change in transportation and technology, these activities are increasingly important to a national and global transporta-

tion community facing many opportunities and challenges. Although it has long led efforts to ensure a well-designed, solidly constructed, and properly maintained transportation system, TRB has expanded its role to reflect society's broader interest in making the system safer, more accessible, less disruptive to communities, more benign to the environment, and more resilient to natural and man-made disasters. TRB supports the transportation community as it grapples with governance, funding, and regulatory issues and as it seeks to understand the changes made by technological developments and on the provision and use of transportation services.

Through its convening activities, TRB brings together many thousands of researchers and practitioners from around the world to share research results and innovations and to discuss current and future issues in transportation. TRB research addresses critical issues faced by owners and operators of the transportation system and develops solutions for practitioners. TRB also shares the results of leading transportation research through the *Transportation Research Record: Journal of the Transportation Research Board* and other publications and through its Transport Research International Documentation (TRID) database, which contains more than 1.1 million entries. TRB also advises the nation on complex, often contentious issues important to policy makers at all levels of government.

TRB is the more than 8,000 volunteers on its committees and research panels; the more than 13,000 attendees at its annual meeting; the



(Left to right:) Malcolm Dougherty, 2017 Executive Committee Chair; Katherine F. Turnbull, 2017 Executive Committee Vice Chair; and Neil Pedersen, TRB Executive Director. (Photo: Risdon Photography)



TRB's convening activities, including the high-profile Annual Meeting, bring together transportation researchers and practitioners from across the globe. (Photo: Risdon Photography)



TRB initiatives encompass all aspects of a societally beneficial transportation system—including its safety and accessibility. (Photo: Seattle DOT)

approximately 35,000 webinar participants and thousands of conference and workshop attendees; the tens of thousands of users of its publications, research reports, and TRID; the experts who serve on the policy study committees that advise the nation; and the dedicated staff who serve all of these participants.

This annual report summarizes TRB's convening, research, and advising accomplishments—as well as the Board's service to the national and the global transportation professional community—during 2017. For more details about the activities of each division in TRB, see pages 14–48.

Organization

As a major program division of the National Academies of Sciences, Engineering, and Medicine, TRB has access to staff in the six other program divisions of the Academies and to experts who are elected by their peers to the honorific societies—the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Medicine—for contributions to scientific research, engineering, or medicine and health. The National Academies provide independent, objective analysis and advice to the nation; conduct activities to solve complex problems; and inform public policy decisions on matters related to science, engineering, and medicine. TRB upholds the National Academies' rigorous standards for objectivity, balance, integrity, and ethics.

The TRB Division Committee conducts oversight of the Board's activities on behalf of the National Academies. Susan Hanson, a member of the National Academy of Sciences, serves as chair of the Division Committee and Chris Hendrickson, a member of the National Academy of Engineering, serves as vice chair. Strategic direction for TRB's activities and programs is provided by the Executive Committee. Twenty-six members of the Executive Committee are appointed from government, academia, and the private sector and represent all modes of transportation;



The 2017 Technical Activities Council provides oversight and strategic direction to the work of more than 5,000 volunteers on TRB's standing committees and task forces. (Photo: Risdon Photography)



The AASHTO Special Committee on Research and Innovation is the governing board for NCHRP.

and 20 ex officio members are top executives from TRB sponsoring agencies. After adopting a strategic plan for TRB, the Executive Committee is monitoring progress on its implementation.

The 220 standing technical committees of TRB cover all modes and a wide variety of issues in transportation. Each committee comprises approximately 30 to 35 members, with additional volunteers on its friends list. The committees organize Annual Meeting and conference sessions, review papers submitted for presentation at the Annual Meeting and for publication in the *Transportation Research Record*, develop research problem statements for the Cooperative Research Programs and other research organizations, and serve as communities of practice for experts in their respective subject areas.

More than 5,080 volunteers fill 6,855 positions on TRB's standing technical committees and task forces. These committees are organized into eleven groups, with oversight provided by the Technical Activities Council and its chair, Hyun-A Park. TRB's Technical Activities Division staff supports the work of the committees.

TRB's three largest Cooperative Research Programs cover highways, airports, and transit. An oversight panel for each program selects research projects, and each project is conducted by a contractor team and guided by a panel of experts. More than 3,300 volunteers serve on CRP project and oversight panels, and TRB's Cooperative Research Programs Division provides staff support for these activities. In 2017, TRB entered into an agreement to launch a Behavioral Traffic Safety Cooperative Research Program with an annual budget of \$2.5 million.

TRB's consensus studies advise on policy issues and review federal research programs. Ap-

proximately 160 volunteers, selected to avoid financial conflicts and to balance expertise and perspectives, serve on these study committees. Their work is overseen by the Executive Committee's Subcommittee on Planning and Policy Review, chaired by Daniel Sperling. TRB's Studies and Special Programs Division provides staff support.

An internationally recognized source of expertise on maritime transportation and marine engineering and technology, TRB's Marine Board identifies needs in maritime research and facilitates information exchange on new technologies, laws and regulations, economics, the environment, and other issues affecting the marine transportation system, port operations, coastal engineering, and governance. At the request of a sponsoring agency or on its own initiative, the Marine Board conducts evaluations of and provides advice on the ability of the nation's marine and maritime industries to operate safely, efficiently, and in an environmentally responsible manner. It comprises 20 members and is chaired by Mary Brooks.

TRB's Executive Office provides strategic direction and oversight of staff, as well as a variety of administrative, publication, communications, and information technology functions. The Administration and Finance Division manages TRB's finances, which encompass support from sponsors and affiliates, service of volunteers on committees and panels, the size of the Annual Meeting, and the number of contracts at any given time.

Detailed reports from each of TRB's divisions begin on page 14.



Chris Hendrickson, Vice Chair of the TRB Division Committee, participates in an Executive Committee meeting. (Photo: Risdon Photography)



The Subcommittee on Planning and Policy Review guides TRB's consensus studies, which advise on policy issues and review federal programs.

Strategic Initiatives

The TRB Executive Committee has identified three topics critical to the future of transportation—transformational technologies, resilience, and the relationship between transportation and public health—and has charged all of TRB’s programs and organizational units with implementing activities and research that advance these topics. The Executive Committee established task forces to recommend activities and research to address each of these areas holistically, discover research gaps, and find ways for TRB to enhance the state of knowledge and the state of practice. The oversight committees for each TRB division also identified activities in the three strategic areas.

TRANSFORMATIONAL TECHNOLOGIES

New and emerging technologies—connected and automated vehicles, shared-use mobility services, and unmanned aerial systems—have the potential to fundamentally change how passengers and goods move in the transportation system. Smart cities, big data, and cybersecurity will affect the transportation system of the future in profound ways.

TRB facilitates a wide range of activities related to transformational technologies.

- Eighty-three sessions addressed transformational technologies at the 2017 TRB Annual Meeting.
- The Automated Vehicle Symposium, cosponsored by TRB and by the Association for Unmanned Vehicle Systems International, attracts more than 1,500 attendees and is TRB’s second-largest meeting each year.



Neil Pedersen spoke at the 2017 Automated Vehicle Symposium. The event is TRB’s second-largest meeting each year. (Photo: AUVSI)

- Many papers on transformational technologies are presented at the Annual Meeting and are published in the *Transportation Research Record*.
- The Cooperative Research Programs explore a variety of issues associated with transformational technologies.
- The TRB Executive Committee has devoted two of its recent policy sessions to cybersecurity and smart cities and has provided strategic direction on how to address these issues.
- TRB has created a website devoted to transformational technologies.¹
- The National Academies–TRB Forum: Preparing for Automated Vehicles and Shared Mobility will bring together leaders from the private sector, research organizations, and government on a regular basis to discuss critical issues on this topic and to provide input on the preparation of an updated research roadmap.

RESILIENCE

Defined as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to naturally occurring or man-made adverse events, resilience is a key focus for the National Academies. Previously, the TRB Executive Committee established a task force to provide strategic direction on resilience-related programs and projects. That task force developed a strategic plan largely focused on adapting to severe weather events and recommended many activities and research projects that now are under way or recently completed.

Recognizing that adaptation and mitigation must both be considered in order to address resilience, and that resilience is tied directly to sustainability, the Executive Committee formed a reconstituted task force in 2017 that focuses on both mitigation and adaptation, as well as on the relationship between resilience and sustainability. TRB committees sponsored 25 sessions related to resilience at the Annual Meeting. The Technical Activities Council created a Resilience Section to identify and address resilience-related focus areas for standing committees. Along with publishing many reports on transportation systems resilience each year, the Cooperative Research Programs have begun to develop a resilience research roadmap.

In May, TRB sponsored a joint symposium with the European Commission, Decarbonizing

¹ www.trb.org/main/SPOTT.aspx



U.S. Coast Guard officers assess storm damage at a port. Resilience to natural or man-made disasters is a major research focus at the National Academies of Sciences, Engineering, and Medicine. (Photo: Coast Guard News, Flickr)

Transport for a Sustainable Future: Mitigating Impacts of the Changing Climate, and continues to participate in the National Academies' Resilient America Roundtable.

TRANSPORTATION AND PUBLIC HEALTH

TRB has partnered with the National Academies' Health and Medicine Division to collaborate on issues related to transportation and public health, which includes staff involvement by each division in the other's committees and activities. The intersection between public health and transportation was the topic of 29 sessions and 35 meetings at the 2017 TRB Annual Meeting.

A project is under way to develop a research roadmap for public health and transportation that will guide TRB's future research activities in this area. Other projects include a guidebook for integrating transportation and health care providers and research on preparing airports for communicable diseases on arriving flights. TRB continues to identify ways to collaborate with the public health community in addressing transportation and public health.

CRITICAL ISSUES IN TRANSPORTATION

TRB issues a report on critical issues in transportation approximately every five years. In 2017, TRB began work to develop the next edition, which aims to identify the most important issues in transportation during the next five to 10 years and to pinpoint future focus areas for TRB's programs and committees, including: economics and regulation; energy and environment; equity; funding and finance; governance; infrastructure and asset management; resilience and security; research, innovation, and workforce challenges;

safety and public health; and transformational technologies. The new edition of *Critical Issues in Transportation* is expected to be completed in late 2018.

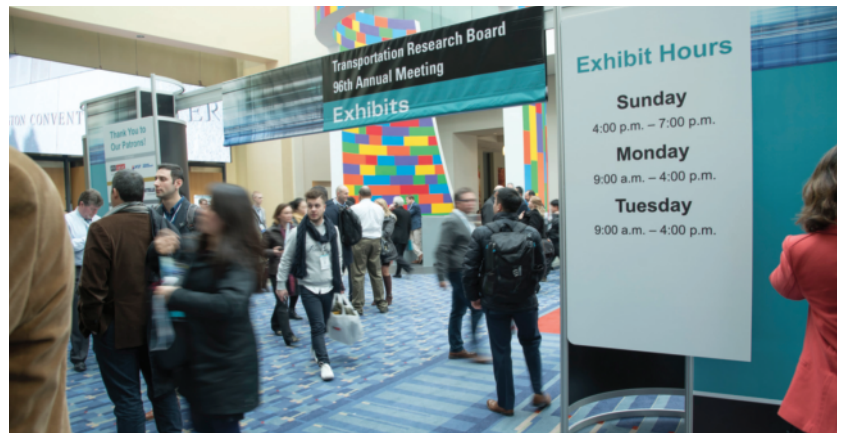
Convening Activities

With more than 13,300 participants, the 2017 Annual Meeting was the largest in TRB history. Attendees were roughly evenly split from among public-sector agencies (32 percent), private-sector organizations (37 percent), and academic institutions (31 percent). More than 800 sessions and workshops covered a range of topics related to transportation, and the event hosted meetings of all 220 of TRB's standing technical committees and task forces—as well as approximately 300 subcommittees.

With its 276 exhibits covering more than 35,000 square feet of exhibit hall space, the Annual Meeting was ranked by the magazine *Trade Show Executive* as one of the 50 fastest-growing shows, both by net square feet and by number of exhibiting companies. At the 2018 Annual Meeting, TRB will introduce its first annual Careers in Motion Job Fair.

In addition to the Annual Meeting, in 2017 TRB sponsored 48 conferences and workshops and cosponsored 36 others on a wide variety of subjects, from specific technical topics to broader policy issues. More detailed information on TRB's annual meeting, conferences, and workshops can be found in the Technical Activities Division report on page 14.

TRB's popular webinar series allows stakeholders to participate in TRB activities without having to travel to events. In 2017, TRB conduct-



The Exhibit Hall at the TRB Annual Meeting is one of the fastest-growing trade shows in the country. (Photo: Risdon Photography)

ed 98 live webinars with an estimated overall attendance of 35,000 and produced 15 prerecorded webinars that were viewed by more than 4,000 people. As with its conferences and workshops, TRB's webinar subjects ranged from specific technical topics to broader issues. Webinars present the results of TRB research, allow standing committees to address and discuss issues, and facilitate the sharing of success stories and lessons learned in research implementation.

TRB's Annual Meeting, conferences, workshops, and webinars provide professional development opportunities for TRB stakeholders at every stage of their career. Many sessions and webinars count as credits for professional engineer license renewals and planner certifications.

Research

TRB manages three large programs through its Cooperative Research Programs Division: the National Cooperative Highway Research Program (NCHRP), the Airport Cooperative Research Program (ACRP), and the Transit Cooperative Research Program (TCRP). Previously authorized cooperative research programs in rail and hazardous materials are nearing completion, and a new Behavioral Traffic Safety Cooperative Research Program began in late 2017. The programs focus largely on applied research—each program's oversight committee is composed of leaders from transportation organizations that will use the products of the research, and that research is contracted out and managed by Cooperative Research Programs Division staff.

In 2017 the Cooperative Research Programs Division managed approximately 517 ongoing



NCHRP projects are guided by panels of technical specialists and practitioners, who define the scope of work and select the projects' contractors.



TRB conferences and workshops facilitate career development and networking opportunities for transportation students and professionals. (Photo: Risdon Photography)

projects and issued 118 publications, with an increasing focus on the implementation of research results by transportation stakeholders and proactive efforts to improve usability and awareness of research products for practitioners. More detail on each of TRB's Cooperative Research Programs is provided on page 29.

In addition to managing its own research programs, TRB features research conducted by others through its Annual Meeting and in the *Transportation Research Record*, the largest transportation journal in the world. Of the 6,000 papers submitted for peer review in summer 2017, 3,400 were selected for presentation at the 2018 TRB Annual Meeting and 900 were selected to be published in the 2018 *Transportation Research Record*. In 2017 several measures were taken to streamline the publication process, including outsourcing the steps in the process from final acceptance of a paper through publication.

TRB also showcases research in the Transportation Research Information Services databases. The largest of these is TRID, which contains more than 1.1 million records of citations and abstracts of transportation research from around the world. TRB also maintains the Publications Index, Research Needs Statements, Research in Progress, and Practice-Ready Papers databases.

Second Strategic Highway Research Program

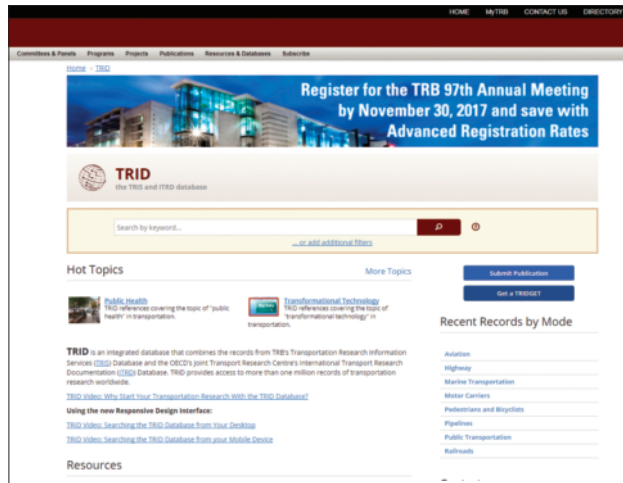
The Second Strategic Highway Research Program (SHRP 2) conducted the largest naturalistic

driving study ever undertaken. More than 3,000 vehicles, equipped with video cameras and other data collection devices, provided information on drivers and their vehicles in natural driving conditions and gathered more than two petabytes of safety data that never before had been available, especially data related to driving behavior. Through 2019, TRB is responsible for stewardship of the database and for making the data available to qualified researchers to conduct safety-related research studies. To date more than 250 data use licenses have been issued and more than 70 research papers using the data have been published, with many more expected over the next few years. TRB also is developing a plan for stewardship of the database after 2019.

Advising Activities

The TRB Studies and Special Programs Division produced many significant consensus study reports in 2017. Prepared by National Academies-appointed committees, the volumes underwent a rigorous peer-review process before being published as National Academies reports. They include the following:

- *In-Service Performance Evaluation of Guardrail End Treatments*, which recommends a research design for evaluating the in-service performance of guardrail end treatments and advises on the required data and actions for conducting evaluations.
- *Designing Safety Regulations for High-Hazard Industries*, which examines the salient factors for regulators of high-hazard industries choosing among regulatory design types.
- *Safely Transporting Hazardous Liquids and Gases in a Changing U.S. Energy Landscape*, which offers recommendations to the U.S. Department of Transportation's (DOT's) Pipelines and Hazardous Materials Safety Administration and Federal Railroad Administration for developing a more robust safety assurance and emergency response capability for future safety challenges.
- *Acquisition and Operation of Polar Icebreakers: Fulfilling the Nation's Needs*, which recommends building four heavy polar icebreakers, proposes an acquisition strategy, and identifies and recommends ways for the U.S. Coast Guard to improve the nation's polar icebreaking capacity.
- *Review of the Department of Transportation Testing and Analysis Results for Electronically Controlled*



TRID is TRB's largest database, with more than 1.1 million records.

Pneumatic Brakes, which reviews and provides advice on U.S. DOT's plan to test the assumptions underlying its comparisons between the emergency braking performance of electronically controlled pneumatic brakes and the performance of conventional braking systems on railroad tank cars.

Additional consensus studies are under way, including a large study on the future of the U.S. Interstate Highway System, a study to develop a roadmap for truck size and weight research, a study of the regulatory requirements for small propane gas pipeline systems, and a study of the need for evidentiary protection of transit agency safety information.

In addition to producing consensus studies, TRB convenes committees to review the research programs of several modal administrations in U.S. DOT. Research program reviews currently are under way for the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA).

Diversity and Inclusion

In late 2016, the TRB Executive Committee established a Task Force on Diversity and Inclusion, chaired by Executive Committee member Nathaniel Ford and composed of representatives from each of TRB's oversight committees and key standing technical committees. The task force worked during 2017 to develop a strategic plan to address diversity and inclusion issues for underrepresented groups—minorities, women, persons with disabilities, and young profes-

sionals—in TRB’s committees, programs, staff, research panels, contracting organizations, and partnerships with minority- and women-serving transportation organizations. The plan will be presented for adoption by the TRB Executive Committee at its January 2018 meeting.

The TRB Minority Student Fellows Program continues to offer opportunities to get involved in TRB to transportation students at historically minority-serving colleges and universities. Under the guidance of a faculty advisor, transportation students from participating institutions submit papers for peer review and presentation at the Annual Meeting. In 2017, the program provided travel expenses for 23 students to attend the meeting. The Minority Student Fellows Program is supported by FHWA as well as by corporations and individuals.

International Cooperation

The TRB Executive Committee formed a Subcommittee on International Activities in 2016 to encourage global knowledge sharing among transportation professionals, collaborative research between TRB and other international organizations, and strategic international partnerships to advance the mission of the National Academies and TRB. The subcommittee addresses the engagement of professionals from other nations in TRB activities, TRB’s participation in international forums and conferences, and cooperative research opportunities with and joint activities between TRB and other international research organizations.

TRB recently signed memoranda of understanding (MOUs) with the World Road Association and with the European Conference of Transport Research Institutes. TRB also is conducting discussions regarding several more international MOUs and is coordinating with research organizations in France, the Netherlands, and Canada to conduct joint research projects.

In 2017, TRB cosponsored 10 conferences outside the United States. TRB representatives spoke at several other international conferences and many TRB conferences included international speakers and participants. At the 2017 Annual Meeting, more than 2,400 attendees—or 18 percent of the total—came from outside the United States. TRB and its participants benefit greatly from ever-increasing international cooperative efforts.



Neil Pedersen (*left*) and Patrick Malléjacq (*right*), World Road Association (PIARC) Secretary General, signed a memorandum of understanding between TRB and PIARC in January. (Photo: Risdon Photography)

Communications

Guided by its marketing and communications plan, TRB continues to increase awareness and knowledge of its products and services within the transportation community. A new home page features graphics, photos, and a more flexible design that allows TRB to easily and quickly convey information to users.² The new website incorporates responsive design, which changes the visual structure of a web page based on a user’s screen size, platform, and orientation. ACRP instituted a similar change on its website.

TRB deployed a social media plan to enhance its push communications, resulting in significantly increased engagement with Twitter, Facebook, and LinkedIn followers. This year also marked the 15th anniversary of the TRB E-Newsletter, which now has a circulation of more than 70,000.³

TRB’s webinar series continues to grow in popularity and attendance.⁴ In 2017 the webinar registration process was integrated with the My-TRB system, to streamline the user experience and to enhance the value of the information offered to TRB sponsors.

Preparing for TRB’s Centennial

TRB will celebrate 100 years of service to the nation and the transportation profession in 2020. In preparation for this centennial milestone, the TRB Executive Committee has appointed a task

² www.trb.org

³ www.trb.org/Publications/PubsTRBENewsletter.aspx

⁴ <https://webinar.mytrb.org/Webinars>

force to plan for the celebration, which will promote the value of transportation research and TRB's critical role in the process. The theme of the celebration will be "Moving Ideas: Advancing Society—100 Years of Transportation Research." In addition to events that will span the year between the 2020 and 2021 TRB Annual Meetings, an author has been contracted to prepare a book celebrating TRB's 100th birthday.

Finances

TRB's 2017 financial statement includes sources of revenues for each of TRB's major programs and appears on pages 10–11.

Total 2017 revenues for TRB's core program, which consists of its convening activities, publications, and library services, are estimated to be \$16.2 million, with total expenditures estimated to be \$16.5 million. The difference between income and expenditures is funded with monies drawn from the reserve fund in accordance with TRB's long-term financial plan. State DOTs fund 44 percent (\$7.4 million) of total core program expenditures; federal agencies, 16 percent (\$2.8 million), with more than half of this amount coming from FHWA; other sponsors, 1 percent (\$0.2 million); TRB sales and fees, 37 percent (\$6.2 million); and the reserve fund, 2 percent (\$0.3 million). Conferences and workshops are supported by fees—\$1.6 million in 2017.

In 2017 the TRB Executive Committee approved the creation of a new Global Affiliates Program to further diversify TRB's revenue sources and to provide additional financial support for its programs. In the Global Affiliates Program, organizations can support TRB at one of six different levels in exchange for participation in various programs and recognition for their sponsorship.

Funding for all of the Cooperative Research Programs totaled \$59.4 million in 2017. State DOTs supply the largest share of these funds, \$38.2 million to support NCHRP. ACRP received \$14.8 million from the Federal Aviation Administration and TCRP received \$5.7 million from FTA. TRB's expenditures for SHRP 2 totaled \$4.7 million in 2017 with funds coming from FHWA. Funding for TRB's policy studies totaled \$4.8 million in 2017, which comes from sponsors for each study, 90 percent of which are federal agencies.

Total expenditures for all of TRB's programs in 2017 are estimated at \$88 million. Of this, 51.8 percent comes from state DOTs, 38.7 percent



(Left to right:) Greg Winfree, Michael Trentacoste, and Todd Ripley—of the Texas A&M Transportation Institute, a TRB sustaining affiliate; the Federal Highway Administration, a TRB sponsor; and the Maritime Administration, a Marine Board sponsor, respectively—confer at the Annual Meeting. (Photo: Risdon Photography)

comes from federal sources, 9.2 percent comes from other sources, and 0.3 percent comes from TRB's reserve fund, which is intended for use in an unanticipated revenue shortfall. The target for the reserve fund is between 75 and 100 percent of core program expenditures each year. At the end of the year, the reserve fund is anticipated to be 99 percent of projected 2017 core program expenditures.

STATEMENT OF ACTIVITIES

Funding Support by Program and Expenditures, Calendar Years 2016 and 2017

	2016 (ACTUAL)	2017 (PROJECTED)*
Core Technical Activities		
State Highway and Transportation Departments (State DOTs)	\$7,140,000	\$7,395,000
Federal Government		
Federal Highway Administration (FHWA)	1,675,000	1,450,000
Office of the Assistant Secretary of Transportation for Research and Technology (OST-R)	300,000	300,000
Federal Transit Administration (FTA)	250,000	250,000
National Highway Traffic Safety Administration	212,000	212,000
Bureau of Indian Affairs, Department of the Interior	85,000	85,000
Federal Motor Carrier Safety Administration (FMCSA)	75,000	75,000
Department of Energy (DOE)	65,000	65,000
Environmental Protection Agency (EPA)	0	65,000
Federal Aviation Administration (FAA)	65,000	65,000
Federal Railroad Administration (FRA)	65,000	65,000
U.S. Air Force Civil Engineer Center	65,000	65,000
U.S. Army Corps of Engineers	75,000	75,000
Subtotal, Federal Government	\$2,932,000	\$2,772,000
Other		
American Public Transportation Association	65,000	65,000
Association of American Railroads	65,000	65,000
South Coast Air Quality Management District, California	65,000	0
California Air Resources Board	0	65,000
Fees and Sales	6,104,000	5,872,000
Subtotal, Other	\$6,299,000	\$6,067,000
Total, Core Technical Activities	\$16,371,000	\$16,234,000
Marine Board Core Program		
U.S. Coast Guard	75,000	75,000
U.S. Army Corps of Engineers	75,000	75,000
National Oceanic and Atmospheric Administration	40,000	40,000
Bureau of Safety and Environmental Enforcement	30,000	30,000
Maritime Administration	19,000	19,000
U.S. Navy	12,000	12,000
Total, Marine Board Core Program	\$251,000	\$251,000
Cooperative Research Programs (CRP)		
National Cooperative Highway Research Program (State DOTs)	37,984,000	38,155,000
Airport Cooperative Research Program (FAA)	14,648,000	14,798,000
Transit Cooperative Research Program (FTA)	5,883,000	5,689,000
National Cooperative Freight Research Program (OST-R)	510,000	918,000
National Cooperative Rail Research Program (FRA)	370,000	49,000
Hazardous Materials Cooperative Research Program (Pipeline and Hazardous Materials Safety Administration)	73,000	54,000
Total, Cooperative Research Programs	\$59,468,000	\$59,663,000

	2016 (ACTUAL)	2017 (PROJECTED)*
Rail Safety IDEA Program	\$315,000	\$381,000
Strategic Highway Research Program 2 Safety Data Phase 1	\$5,336,000	\$4,717,000
Policy Studies	\$4,322,000	\$4,789,000
Conferences and Workshops	\$2,171,000	\$1,642,000
TRB TOTAL	\$88,234,000	\$87,677,000
Sources of Funds		
Federal	34,645,000	34,042,000
State DOTs	45,124,000	45,550,000
Other	8,465,000	8,085,000
	\$88,234,000	\$87,677,000

Expenditures by Major Cost Category

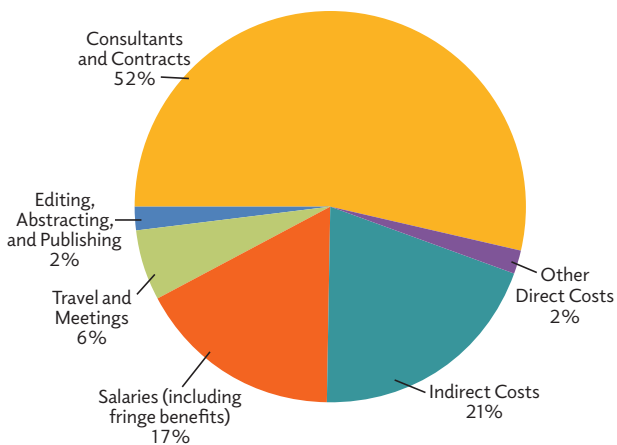
Salaries (including fringe benefits)	15,173,000	14,986,000
Travel and Meetings	4,785,000	5,355,000
Editing, Abstracting, Publishing	2,629,000	1,866,000
Consultants and Contracts	45,191,000	47,979,000
Other Direct Costs	2,022,000	1,879,000
Indirect Costs	18,588,000	17,858,000
Total Expenditures	\$88,388,000	\$87,923,000

TRB Reserve Fund

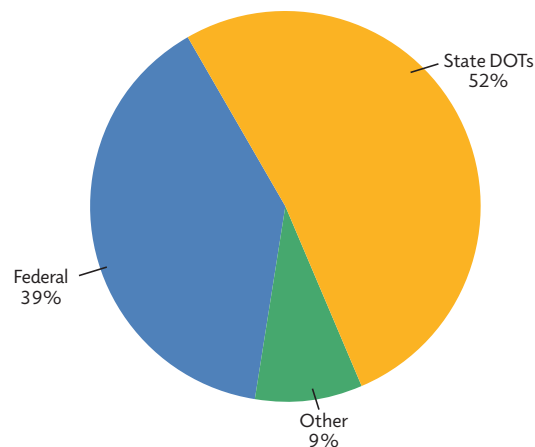
Fund balance, end of previous fiscal year	\$16,734,000	\$16,580,000
Plus (minus) current fiscal year income over (under) expenditures	-154,000	-246,000
Balance, current fiscal year	\$16,580,000	\$16,334,000

In 1965, the TRB Executive Committee approved a reserve fund to provide for orderly adjustments in the event of a temporary shortfall in anticipated revenues for TRB Technical activities. This fund, built up over the years from surplus income in excess of expenditures from nonfederal sources for any one fiscal year, is reserved for expenditures in excess of income for any later fiscal year under a fixed budget approved by the TRB Executive Committee.

Distribution of TRB Expenditures



TRB Funding Support



*Calendar Year 2017 comprises actual data through October and estimates for the rest of the year.

TRANSPORTATION RESEARCH BOARD

Chair: Malcolm Dougherty, Director, California Department of Transportation, Sacramento

Vice Chair: Katherine F. Turnbull, Executive Associate Director and Research Scientist, Texas A&M Transportation Institute, College Station

Executive Director: Neil J. Pedersen, Transportation Research Board

Victoria A. Arroyo, Executive Director, Georgetown Climate Center; Assistant Dean, Centers and Institutes; and Professor and Director, Environmental Law Program, Georgetown University Law Center, Washington, D.C.

Scott E. Bennett, Director, Arkansas State Highway and Transportation Department, Little Rock

Jennifer Cohan, Secretary, Delaware Department of Transportation, Dover

James M. Crites, Executive Vice President of Operations, Dallas-Fort Worth International Airport, Texas (Retired) (Past Chair, 2016)

Nathaniel P. Ford, Sr., Executive Director-CEO, Jacksonville Transportation Authority, Jacksonville, Florida

A. Stewart Fotheringham, Professor, School of Geographical Sciences and Urban Planning, Arizona State University, Tempe

John S. Halikowski, Director, Arizona Department of Transportation, Phoenix

Susan Hanson, Distinguished University Professor Emerita, Graduate School of Geography, Clark University, Worcester, Massachusetts

Steve Heminger, Executive Director, Metropolitan Transportation Commission, Oakland, California

Chris T. Hendrickson, Hamerschlag Professor of Engineering, Carnegie Mellon University, Pittsburgh, Pennsylvania

Jeffrey D. Holt, Managing Director, Power, Energy, and Infrastructure Group, BMO Capital Markets Corporation, New York

S. Jack Hu, Vice President for Research and J. Reid and Polly Anderson Professor of Manufacturing, University of Michigan, Ann Arbor

Roger B. Huff, President, HGLC, LLC, Farmington Hills, Michigan

Geraldine Knatz, Professor, Sol Price School of Public Policy, Viterbi School of Engineering, University of Southern California, Los Angeles

Melinda McGrath, Executive Director, Mississippi Department of Transportation, Jackson

Patrick K. McKenna, Director, Missouri Department of Transportation, Jefferson City

James P. Redeker, Commissioner, Connecticut Department of Transportation, Newington

Mark L. Rosenberg, Executive Director, The Task Force for Global Health, Inc., Decatur, Georgia

Daniel Sperling, Professor of Civil Engineering and Environmental Science and Policy; Director, Institute of Transportation Studies, University of California, Davis (Past Chair, 2015)

Gary C. Thomas, President and Executive Director, Dallas Area Rapid Transit, Dallas, Texas

Pat Thomas, Senior Vice President of State Government Affairs, United Parcel Service, Washington, D.C. (Retired)

James M. Tien, Distinguished Professor and Dean Emeritus, College of Engineering, University of Miami, Coral Gables, Florida

Dean H. Wise, Vice President of Network Strategy, Burlington Northern Santa Fe Railway, Fort Worth, Texas

Charles A. Zelle, Commissioner, Minnesota Department of Transportation, Saint Paul



Dougherty



Turnbull



Pedersen



Arroyo



Bennett



Cohan



Crites



Ford



Fotheringham



Halikowski



Hanson



Heminger



Hendrickson



Holt



Hu



Huff



Knatz



McGrath



McKenna



Redeker



Rosenberg



Sperling



G. Thomas



P. Thomas

2017 EXECUTIVE COMMITTEE *



Tien



Wise



Zelle



Berube



Brooks



Buzby



Cliff



Elliott



Farley



Gautreaux



Gishi



Gray



Hall



Hendrickson



Huerta



King



Kirley



Nastri



Rutland



Semonite



Simon



White



Williams



Wright



Zukunft

Michael Berube, Deputy Assistant Secretary for Transportation, U.S. Department of Energy (ex officio)

Mary R. Brooks, Professor Emerita, Dalhousie University, Halifax, Nova Scotia, Canada, and Chair, TRB Marine Board (ex officio)

Mark H. Buzby (Rear Admiral, U.S. Navy), Administrator, Maritime Administration, U.S. Department of Transportation (ex officio)

Steven Cliff, Deputy Executive Officer, California Air Resources Board, Sacramento (ex officio)

Howard R. Elliott, Administrator, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation (ex officio)

Audrey Farley, Executive Director, Office of the Assistant Secretary for Research and Technology, U.S. Department of Transportation (ex officio)

Cathy F. Gautreaux, Deputy Administrator, Federal Motor Carrier Safety Administration, U.S. Department of Transportation (ex officio)

LeRoy Gishi, Chief, Division of Transportation, Bureau of Indian Affairs, U.S. Department of the Interior, Washington, D.C. (ex officio)

John T. Gray II, Senior Vice President, Policy and Economics, Association of American Railroads, Washington, D.C. (ex officio)

Heath Hall, Deputy Administrator, Federal Railroad Administration, U.S. Department of Transportation (ex officio)

Brandye Hendrickson, Deputy Administrator, Federal Highway Administration, U.S. Department of Transportation (ex officio)

Michael P. Huerta, Administrator, Federal Aviation Administration, U.S. Department of Transportation (ex officio)

Heidi King, Acting Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation (ex officio)

Bevan B. Kirley, Research Associate, University of North Carolina Highway Safety Research Center, Chapel Hill, and Chair, TRB Young Members Council (ex officio)

Wayne Nastri, Acting Executive Officer, South Coast Air Quality Management District, Diamond Bar, California (ex officio)

Craig A. Rutland, U.S. Air Force Pavement Engineer, U.S. Air Force Civil Engineer Center, Tyndall Air Force Base, Florida (ex officio)

Todd T. Semonite (Lieutenant General, U.S. Army), Chief of Engineers and Commanding General, U.S. Army Corps of Engineers, Washington, D.C. (ex officio)

Karl Simon, Director, Transportation and Climate Division, U.S. Environmental Protection Agency (ex officio)

Richard A. White, Acting President and CEO, American Public Transportation Association, Washington, D.C. (ex officio)

K. Jane Williams, Deputy Administrator, Federal Transit Administration, U.S. Department of Transportation (ex officio)

Frederick G. (Bud) Wright, Executive Director, American Association of State Highway and Transportation Officials, Washington, D.C. (ex officio)

Paul F. Zukunft (Admiral, U.S. Coast Guard), Commandant, U.S. Coast Guard, U.S. Department of Homeland Security (ex officio)

* Membership as of November 2017.

TECHNICAL ACTIVITIES



THE TECHNICAL ACTIVITIES DIVISION provides opportunities for transportation professionals and researchers to advance the knowledge and practice of the many disciplines that support all modes of transportation. With specialists in each mode and in several disciplines, the division's staff works with thousands of volunteers who are members of more than 200 TRB standing committees to share information, identify research needs, and implement other initiatives on behalf of TRB sponsors and the transportation community.

The Technical Activities Council oversees the organization and activities of the TRB standing committees. Hyun-A C. Park, President of Spy Pond Partners, LLC, chairs the council. TRB representatives in each state department of transportation (DOT) and in sponsoring organizations, universities, and transit agencies serve as liaisons to the committees and to division activities.

The Technical Activities Division continues to focus on three hot topics identified by the TRB Executive Committee: transformative technologies, transportation resilience and sustainability, and transportation and public health. In 2017, the experience and interests of Technical Activities standing committees advanced the discussion and knowledge of the strategic topics through key activities; highlights follow.

Transformative Technologies

Transformative—or disruptive—technologies consist of innovative tools and techniques that



(Left to right:) State transportation secretaries Paula Hammond (Washington State, 2007–2013), Jennifer Cohan (Delaware), Victoria Sheehan (New Hampshire), Leslie Richards (Pennsylvania), Stephanie Pollack (Massachusetts), and Susan Martinovich (Nevada, 2007–2012) discussed transportation leadership in an Annual Meeting session. (Photo: Risdon Photography)

fundamentally transform transportation. Examples include connected and automated vehicles (CAVs), big data, on-demand and shared transportation services, and unmanned aerial systems. Highlights of TRB activities in 2017 related to transformative technologies included the following:

- TRB and the Association for Unmanned Vehicle Systems International cosponsored the Automated Vehicles Symposium in San Francisco, California, in July. This event focused on the challenges and opportunities related to increased automation of motor vehicles, as well as the environments in which they operate.
- Along with the International Bridge, Tunnel, and Turnpike Association, TRB cosponsored the Symposium on Managed Lanes and All-Electron-



TRB Technical Activities Director Ann Brach welcomes new attendees to the 2017 Annual Meeting. (Photo: Risdon Photography)



The Automated Vehicle Symposium in July, cosponsored by TRB, tackled the challenges and opportunities introduced by automated and connected vehicles. (Photo: AUVSI)

ic Tolling in Dallas, Texas, in July. To stimulate project development and adoption of the latest technology, the joint symposium explored the latest research, policies, and innovative practices on toll roads and tolled managed lanes.

■ In November, the AAA Foundation for Traffic Safety, the University of Utah, and TRB cospon-

sored the Forum on the Impact of Vehicle Technologies and Automation on Users. The two-day event in Salt Lake City, Utah, convened representatives and experts from the research community, government, and industry to discuss and identify research needs and directions related to the impact of vehicle technologies and automation on drivers and other users.

■ Workshops and sessions on transformative technologies at the 2017 TRB Annual Meeting addressed such topics as social and economic factors in autonomous and connected vehicles, traditional and emerging on-demand transportation, driver adaptation to automation and advanced driver assistance systems, managed lane networks and connected mobility technology, and commercial space travel.



A driverless Uber vehicle on the road. On-demand transportation, automation, and other transformative technologies were the focus of many TRB activities in 2017. (Photo: zombieite, Flickr)

Transportation Resilience and Sustainability

Resilience is the ability of transportation systems to prevent, withstand, respond to, and recover from extreme events caused by natural forces or human activities. Sustainability ensures that transportation researchers and policy makers meet current needs without risking or compromising the ability of future generations to access transportation. In 2017, 51 committees publicly addressed resilience topics and 39 committees focused on sustainability research. The intersection of the two topics is relevant to TRB stake-



Hyun-A C. Park
Council Chair
Technical Activities



Joseph Schofer
Chair
Policy and
Organization Group



Ram M. Pendyala
Chair
Planning and
Environment Group



D. Stephen Lane
Chair
Design and
Construction Group



William Varnedoe
Chair
Operations and
Preservation Group



Robert Shea
Chair
Legal Resources
Group



David Harkey
Chair
Safety and Systems
Users Group



Dennis Hinebaugh
Chair
Public Transportation
Group



**George Avery
Grimes**
Chair
Rail Group



Anne Goodchild
Chair
Freight Systems
Group



David Ballard
Chair
Aviation Group



Eric Shen
Chair
Marine Group



Coco Briseno
State DOT
Representative



Bevan Kirley
Young Members
Council
Representative



Ann M. Brach
Director
TRB Technical
Activities Division



Urban search and rescue teams help evacuate victims of Hurricane Harvey flooding in Houston, Texas. At TRB, a new task force and stakeholder group, as well as many Annual Meeting workshops and sessions, address transportation resilience and sustainability research. (Photo: FEMA News Photo)

holders and activities involving resilience and sustainability in 2017 included the following:

- Establishing a new Resilience and Sustainability Task Force with the latitude to deliver strategic direction on resilience and sustainability issues facing the transportation community.
- As part of the Transportation Systems Resilience Section's strategic communications plan, forming a virtual lifeline infrastructure and emergency services stakeholder group to inform section leadership on resilience and sustainability practices and on the needs of federal, state, regional, local, tribal, and territorial agencies and organizations.
- Annual Meeting sessions and workshops addressing such topics as disaster simulation, cybersecurity, evacuation planning, transportation workforce needs, and pavement sustainability.

Transportation and Public Health

Although highway traffic injuries and deaths often are considered a national health crisis, transportation plays a role in other health issues as well, including pollution, access to health care, physical fitness, and infectious diseases. Activities related to transportation and public health at the Annual Meeting included the following:

- Cognitive Perspectives on Aging Drivers;
- Transportation Accessibility for Health, Education, and Jobs;
- Translating Transportation Measures and Metrics into Health Outcomes;



The Route 3 bus connects downtown Baltimore, Maryland, with Sheppard Pratt Hospital. The role of transportation in public health is another hot topic for TRB staff and standing committees. (Photo: Elvert Barnes)

- Building Strategic Institutional Relationships at the Intersection of Health and Transportation; and
- Value-Based Propositions to Link Veterans' Travel with Health Outcomes.

Policy and Organization

The Policy and Organization Group sponsored an Annual Meeting session on Transportation Accessibility for Health, Educations, and Jobs, which included an overview by Bureau of Transportation Statistics Director Patricia S. Hu and presentations from various members of the TRB Executive Committee. The group also sponsored a discussion for section leaders that continued the dialogue on effective leadership approaches for coordinating committees.

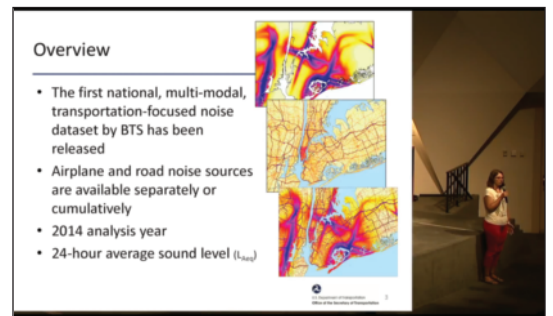
MANAGEMENT AND LEADERSHIP

The standing committees on Performance Management and Asset Management collaborated on an Annual Meeting session, What's Cooking? The Right Blend of Key Ingredients for Optimizing Investment Decisions: Risk, Asset and Performance Management. Committees also worked together on the multimodal workshop Help Wanted: Agency Leaders Speak Out on Critical Research Needs to Support a Dramatically Changing Industry.

DATA AND INFORMATION

Highlights from the Data and Information Section include the following:

- More than 140 participants attended the Innovations in Freight Data Workshop in Irvine, California, in July. A survey following the workshop showed overwhelming interest in learning about



Justyna Goworowska, Bureau of Transportation Statistics, shares information on the National Transportation Road Map at the 8th International Visualization in Transportation Symposium.



Test piles driven before a bridge replacement in coastal North Carolina. Environment and Energy Section committees examined noise and vibration impacts and other environment-related topics at their conferences in 2017. (Photo: North Carolina DOT)

new data—94 percent of respondents want to attend another workshop within the next two years.

- The 8th International Visualization in Transportation Symposium, held in Washington, D.C., in July, addressed visualization in action. Keynote speaker Donna Wong, Federal Reserve Bank of New York, spoke about turning data into a compelling, persuasive story, a theme enhanced by breakout sessions and by a virtual and augmented reality room.

- The workshop Applying Census Data for Transportation: 50 Years of Transportation Planning Data Progress continued the tradition of collaborating with AASHTO’s Census Transportation Planning Products Program to build on past experience using U.S. census data to manage transportation programs and to provide focus and direction to transportation planning, policy, and decision making.

Planning and Environment

TRANSPORTATION SYSTEM PLANNING

The Travel Analysis Section and the Standing Committee on Travel Forecasting Resources continue to add new content to the online Travel Forecasting Resource wiki, responding to evolving demands for better and more reliable travel forecasting tools and models. The wiki, which has been in place for almost 10 years, offers a forum for information exchange on a wide variety of transportation forecasting and modeling issues. The committee contributed updated and revised wiki sections on destination choice models, land use and transportation models, and network assignment. In the fall, the committee held a charrette with internationally renowned travel

analysis experts to complete a new wiki topic on the integration of connected and automated vehicles into travel forecasting models.

ENVIRONMENT, ENERGY, AND CLIMATE CHANGE

Throughout the year, Environment and Energy Section committees sponsored or cosponsored conferences that offered detailed insights into the latest issues of concern for participants and for TRB sponsors, including the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the California Air Resources Board. These conferences focused on specific areas of interest to the committees: ecological concerns, noise and vibration impacts, resource conservation, energy consumption, and alternative technologies, with a particular focus on the potential for significant changes to the environmental and energy regulatory landscape.

Design and Construction

DESIGN

TRB’s first-ever International Roadside Safety Conference was held in San Francisco in June. Sponsored by the Standing Committee on Roadside Safety Design, the conference attracted more than 230 registrants, 69 of whom were international and hailed from more than two dozen countries. Three plenary sessions featured such distinguished speakers as Malcolm Dougherty, Director of the California Department of Transportation and TRB Executive Committee Chair. Of the technical presentations in the conference’s 30 breakout sessions, 50 appeared as papers and 70 as abstracts in Transportation Research E-Circular 220, *First International Roadside Safety Conference: Safer Roads, Saving Lives, Saving Money*.



Research presented at the first International Roadside Safety Conference included full-scale testing of retrofit bridge rails for causeway bridges over Lake Pontchartrain in Louisiana. (Photo: William F. Williams, Texas A&M Transportation Institute)



The 68th Highway Geologist Symposium in May featured the State-of-the-Art Practices in Subsurface Investigations Workshop.



Construction of an interior precast panel for one of the SR-520 bridge pontoons in Washington State. Committees in the Construction and Materials Sections organized workshops on such topics as precast concrete pavement technologies. (Photo: Washington State DOT)

CONSTRUCTION AND MATERIALS

Committees in the Construction and Materials Sections gathered during the summer to review research needs and scrutinize developments in new technologies. Among these was the Standing Committee on Critical Issues and Emerging Technologies in Asphalt, which addressed strategies to achieve broader implementation of warm-mix asphalt, invited state DOTs and industry representatives to share new specifications, and reviewed sample projects with specially modified paving materials for long-term performance. A joint meeting of the Standing Committees on Design and Rehabilitation of Concrete Pavements and on Concrete Pavement Construction and Rehabilitation examined research results for mix designs that minimize joint damage from deicing salts and for unbonded overlay interlayer systems and featured a visit to the site of a recent project that used unbonded technologies.

The Standing Committee on Disadvantaged Business Enterprises (DBE) organized a cross-cutting session at the 56th Annual Workshop on Transportation Law that highlighted effective ways to administer DBE programs in design-build projects. Other committees organized workshops to educate practitioners on new specifications for performance-engineered concrete, demonstrate the use of innovative precast concrete pavement technologies for rapid rehabilitation, and identify best practices for quality management systems in design-build construction projects.

GEOTECHNICAL ENGINEERING

TRB's geology and geotechnical committees organized two summer workshops, facilitating

focused discussions among the more than 60 participants that attended each event:

- The State-of-the-Art Practices in Subsurface Investigations Workshop was held in conjunction with the 68th Highway Geologist Symposium in Marietta, Georgia, in May. The workshop featured discussions on geophysical modeling and other new and transformative practices in subsurface investigations.
- The Natural Resources, Sustainability, and Their Intermodal Connections Workshop in Duluth, Minnesota, in July brought together many local and national interests from across several disciplines. Topics included sustainable pavements and materials, public-private partnerships, Brownfield projects and habitat restoration, and the use of mining and industrial byproducts as aggregates.

OPERATIONS AND PRESERVATION

Operations research encompasses such issues as the rapid pace of CAV technology development. Automobile manufacturers and suppliers, technology companies, and transportation agencies spend billions of dollars in research and development to advance this transformative technology for safety, mobility, energy, and the environment. For public transportation agencies, the impacts of CAV are wide-ranging and include transportation operations, safety, geometric design, and many other areas.

To bridge the gap between the public transportation agencies, the academic research community, and the automated driving industry, the standing committees on Intelligent Transportation Systems and on Vehicle-Highway Automation cosponsored the 6th Symposium on Automated Vehicles in San Francisco, conven-



Electronic tolling and other congestion pricing technologies were examined at conferences and workshops hosted by Operations and Preservation Group committees in 2017. (Photo: Tony Webster, Flickr)



Safety and operational performance were among the topics addressed at the 5th International Conference on Roundabouts. (Photo: Carl Sundstrom)

ing nearly 1,500 participants from industry, academia, public agencies, and other stakeholder organizations.

In addition, in 2017 all operations-related committees held midyear meetings or conferences, including the following:

- The Standing Committees on Managed Lanes and Congestion Pricing cosponsored the 2017 Symposium on Managed Lanes and All-Electronic Tolling in Dallas, Texas;
- The Standing Committees on Geometric Design and Operational Effects of Geometrics cosponsored the 5th Urban Street Symposium in Raleigh, North Carolina; and
- The Standing Committee on Traffic Flow Theory cosponsored the 22nd International Symposium on Transportation and Traffic Theory in Evanston, Illinois.

Safety and Systems Users

Highlights from the 2017 activities of the 18 standing committees in the Safety and Systems Users Group include the following:

- The Standing Committee on Roundabouts sponsored the 5th International Conference on Roundabouts. More than 300 individuals representing 42 states and 11 countries gathered to exchange technical, policy, planning, operational, and administrative information on all aspects of roundabouts, including safety and operational performance.
- The midyear meeting of the Standing Committee on Alcohol, Other Drugs, and Transportation focused on the safety implications of increased cannabis use. The committee explored

such issues as determining the safety impact of cannabis use; the response of the criminal justice system, including law enforcement, toxicologists, prosecutors, judges, and others; critical research questions; and data needs.

- Other individual committee and subcommittee midyear meetings focused on such topics as advancing awareness and utilization of advanced vehicle technologies by older consumers, understanding how adolescents learn to drive safely, and discussing the latest research in and future direction of highway safety performance analysis.

Legal Resources

TRB's Legal Resources Group sponsored the 56th Annual Workshop on Transportation Law in Salt Lake City, Utah, in July. The more than 150 registrants included representatives from federal, state, and local transportation agencies as well as from the private sector. The workshop opened with a plenary session featuring the chief legal officers of the Federal Highway Administration (FHWA), Federal Transit Administration, and Federal Railroad Administration, each of whom spoke about critical issues at their agencies. More than 50 speakers presented at 16 breakout sessions, which were followed by a plenary session on legal ethics. Each of the seven committees comprising the Legal Resources Group held their midyear meetings at the event; a workshop dinner featured a keynote presentation by Carlos Braceras, Director of Utah DOT.

Aviation

TRB's nine aviation-oriented committees have focused on new and emerging technologies and



The Kennedy Space Center's Launch Complex 39A is operated by SpaceX, under a property agreement with the National Aeronautics and Space Administration. The Commercial Space Transportation Subcommittee examines planning, research, and other efforts needed to integrate commercial space transportation into the multi-modal system. (Photo: Kim Shiflett, NASA)

their impacts on the transportation system. The Subcommittees on Commercial Space Transportation and on Unmanned Aircraft Systems (UAS) promote a better understanding of how these quickly emerging markets are advancing and are changing the transportation landscape. Leaders of the Federal Aviation Administration (FAA)—a TRB sponsor—participate in the subcommittees and also have sought input from the UAS community specifically, through a sponsored workshop on demand as it relates to FAA’s annually produced forecast of operations. The committees also have helped to advance industry dialogue through meetings addressing intergovernmental relations; system planning; environmental impacts; system capacity; and economic outlooks for the helicopter, commercial airline, and business aviation markets.

Marine

The standing committees of the Marine Group and the Marine Board have focused heavily on maritime-related infrastructure challenges. Events and meetings have examined pathways and research to enable ports and waterways to meet increasing capacity and resiliency demands. As part of their discussions and programming, committees addressed the challenges faced by U.S. ports and connecting infrastructure related to the introduction of megaships to containerized trade, inland waterways systems resilience, and environmental considerations for port expansion.

In 2017, the Marine Board organized sessions on funding marine transportation infrastructure, autonomous ships and shipping, structural



Growth in state-supported corridors and funding challenges at Amtrak were among the many topics addressed by Rail Group committees in 2017. (Photo: Doug Riddell)

health monitoring for innovative asset management of waterways infrastructure, and sea-level rise and extreme weather impacts on civil and military marine transportation infrastructure.

Rail

The U.S. railroad industry confronted many challenges in 2017, including funding uncertainties for Amtrak, continued downward pressure on coal and crude oil shipments, calls for economic regulation reform, and the trade-off between customer service and financial performance. State-supported Amtrak service in various corridors continued to thrive and freight intermodal service continued to grow in importance to the success of freight railroads. TRB cosponsored the following two rail conferences, which attracted national and international audiences:

- The Joint Rail Conference, Highlighting Engineering Solutions for Tomorrow’s Transportation Needs, in Philadelphia, Pennsylvania, in April, and
- The Midwest Rail Conference, Midwest Connections: Passenger and Freight Rail Look to the Future, in Kalamazoo, Michigan, in August.



A panel discussion at the Annual Meeting addressed the infrastructure challenges posed by megaships. (Photo: Risdon Photography)

Freight Systems

Standing committees in the Freight Systems Group have focused intensely on transformational technologies and their possible effects on multimodal freight transportation, supply chain practices, and local delivery. In 2017, the Freight Systems Group

- Organized Freight Day, a full day of well-attended, high-profile sessions at the Annual Meeting that addressed freight transportation expertise at the local level, urban food delivery challenges and practices, and freight technology and supply chain innovations, as well as additive manufacturing, robotics, unmanned aerial vehicles, truck platooning, and seatrains; and
- Aligned its midyear meetings with the Innovations in Freight Data Workshop in Irvine, California, in May and organized a technical tour of freight facilities and major infrastructure projects near the Ports of Los Angeles and Long Beach.

Public Transportation

TRB staff and members of Public Transportation Group standing committees took part in a Florida DOT peer review to create a research roadmap for emerging technologies. The resulting roadmap emphasized Florida's test bed for automated vehicles in Tampa and the agency's big-data initiative, Florida ROADS. It was recommended that Florida DOT coordinate test-bed activities locally as well as nationally and continue developing expertise in data science. A side discussion on Florida's activities implementing reliability products from the second Strategic Highway Research Program (SHRP 2) sparked renewed attention to travel time reliability at Florida DOT, including



A Florida DOT peer review by Public Transportation Group standing committees and TRB staff led to a renewed focus on travel time reliability at the agency as well as new research directions. (Photo: Daniel Oines, Flickr)

added staff and increased activity.

The Geographic Information Systems (GIS) in Public Transportation Conference was held in Washington, D.C., in September. Cosponsored by TRB, the Urban and Regional Information Systems Association, and the University of South Florida, the conference offered an opportunity for more than 150 practitioners to learn about the application of GIS to public transportation.

Safety Data Program

The SHRP 2 Safety Data Program has stimulated a high level of activity. More than 230 data use licenses have been issued to researchers. Results of research using SHRP 2 safety data have included more than 70 studies published in journals or public domain reports, 17 papers submitted to the 2018 TRB Annual Meeting; and 12 papers presented at the 6th International Symposium on Naturalistic Driving Research in the Netherlands.

The SHRP 2 Naturalistic Driving Study (NDS) Dataverse is a repository of user-developed data sets, research data, and documentation that enables researchers to reuse data sets without the cost of data set development. Established in 2016, Dataverse is linked to the safety data web portal InSight and contains more than 59 data sets. More than 40 requests to reuse data sets have been fulfilled.

At the end of 2016, the Safety Training and Analysis Center at FHWA's Turner-Fairbank Highway Research Center opened a secure data enclave, an access point (along with the secure data enclave at Virginia Tech) for provisioned researchers to view and work with safety data—in



Aviation economist Darryl Jenkins discussed drone delivery and other technologies that could substantially alter the freight system at a Freight Day session at the Annual Meeting. (Photo: Risdon Photography)



An Annual Meeting session helped introduce SHRP 2 Naturalistic Driving Study data to research managers and researchers. (Photo: Risdon Photography)

particular, sensitive NDS data.

The Safety Data Program hosted the 10th SHRP 2 Safety Data Symposium: From Analysis to Results in Washington, D.C., in October. Sixteen researchers from across the United States and abroad presented studies on a wide range of topics. The symposium allowed more than 100 researchers and practitioners to exchange ideas and tools for using SHRP 2 safety data.

The Safety Data Implementation Program is halfway completed; the Safety Data Oversight Committee is considering plans to extend access to the safety data beyond the term of the cooperative agreement with FHWA that expires in August 2020. A major task of the cooperative agreement is the development of a long-term management plan for future phases of the safety data.

Staff News

James B. McDaniel, Senior Program Officer, Legal Research, retired after 25 years of service to TRB. McDaniel supported the committees of the Legal Resources Group and was instrumental to the continued success of TRB's Annual Workshop on Transportation Law. In addition to his work with the Technical Activities Division, he also participated in the production of many Legal Research Digests for the Cooperative Research Programs.

Robert J. Shea joined the Technical Activities Division staff as Senior Program Officer, Legal Research.

Gary A. Jenkins, Associate Program Officer, transferred from the National Cooperative Highway Research Program to the Technical Activities Division.

MAJOR AWARDS

The 2017 Roy W. Crum Award for outstanding transportation research leadership was presented to **Sandra Q. Larson**, Systems Operations Bureau Director, Highway Division, Iowa Department of Transportation (DOT). During her 28 years with Iowa DOT, Larson served as Research and Technology Bureau Director, Engineering Bureau Director, Bridges and Structures Office Director–State Bridge Engineer, Resident Construction Engineer, and Bridge Design Engineer.

Larson served as chair or vice chair for six transportation research committees and panels, including the American Association of State Highway and Transportation Officials (AASHTO) Research Advisory Committee and the AASHTO Standing Committee on Research. She presently is vice chair of the AASHTO Safety Task Force for the second Strategic Highway Research Program. In addition to these leadership roles, Larson has participated in more than 20 TRB panels, committees, and task forces as well as in National Research Council (NRC) committees addressing pavement technology, long-term bridge performance, and the U.S. DOT Truck Size and Weight Study. In 2011, she was named a National Associate of the National Research Council, National Academies of Sciences, Engineering, and Medicine.



H. G. (Gerry) Schwartz, Jr., received the 2017 W. N. Carey, Jr., Distinguished Service Award in recognition of his 20 years of leadership and service to TRB. A nationally recognized civil and environmental engineering leader, Schwartz spent most of his career with Sverdrup Civil, Inc. (now Jacobs Civil). Named President and Chairman in 1993, Schwartz directed transportation, public works, and environmental activities. He served on the advisory boards for Carnegie Mellon University, Washington University, and the University of Texas at Austin, as well as on the board of the Louis Berger Group. He also is President Emeritus of the American Society of Civil Engineers and of the Water Environment Federation and is a Past President of the Academy of Science of St. Louis.

PRESENTED IN 2017



Schwartz's early work with TRB's Committee for a Study for a Future Strategic Highway Research Program and the National Cooperative Highway Research Program (NCHRP) Oversight Panel helped to create SHRP 2, and his later work as vice chair of TRB's Subcommittee for NRC Oversight ensured that NRC procedures and policies were ob-

served in the SHRP 2 projects.

Schwartz served on the TRB Executive Committee for 10 years. He was elected to the National Academy of Engineering in 1997 and was named a National Associate of the National Academies of Sciences, Engineering, and Medicine in 2008.

Robert E. Skinner, Jr., past Executive Director of TRB, was awarded the George S. Bartlett Award for his 30 years of guidance and support of research programs that produced innovations to improve safety, performance, and cost-effectiveness of the nation's roadway system. Under his direction, TRB produced more than 1,000 publications that address highway-related needs and developed, conducted, and delivered the results of SHRP 2—145 research projects that produced 130 products and tools, as well as 132 research reports.

During his 21 years as TRB Executive Director, Skinner addressed many highway-related policy issues, among them the federal role in highway research, transportation investments in response to economic downturns, improving traffic safety, automated highways, and traffic congestion relief.

Skinner joined TRB in 1983. He directed TRB's policy study activities before being named Executive Director in 1994.



The Frank Turner Medal for Lifetime Achievement in Transportation was awarded to the Honorable **Norman Y. Mineta** in recognition of his influential career in aviation, surface transportation and infrastructure, and national security, as well as for his accomplishments in economic development, science and technology policy, foreign and domestic trade, budgetary issues, and civil rights.

Mineta's public-service career spanned 40 years, including service in the U.S. House of Representatives representing San Jose, California; as U.S. Secretary of Commerce; and as the longest-serving Secretary of Transportation in U.S. DOT's history. He guided the creation of the Transportation Security Administration and is credited as the primary author of the Intermodal Surface Transportation Efficiency Act of 1991.

Mineta served as an ex officio member of the TRB Executive Committee and as a member of the Subcommittee for the National Cooperative Highway Research Program. He is a member of the Future Interstate Highway System Study Committee and is President and CEO of Mineta and Associates, LLC.

Bruce M. Smith, Apperson Crump PLC of Memphis, Tennessee, and General Counsel for the Memphis Area Transit Authority, delivered the Thomas B. Deen Distinguished Lecture, "Ethical Issues Facing Today's Transportation Agencies: Transparency and Security, Codes of Conduct, and Ethical Considerations of Public-Private Partnerships."

An active TRB volunteer for 23 years, Smith is the only lawyer to have chaired the TRB Legal Resources Group, the TRB Standing Committee on Transit and Intermodal Transportation Law, and the American Public Transportation Association Legal Affairs Committee. He is credited with developing the format for *Volume 5: Transit Law*, part of *Selected Studies in Transportation Law*, published by NCHRP and the Transit Cooperative Research Program.

Smith has 40 years of law experience, representing regional transportation authorities, transit systems, municipalities, and private-sector transit management firms. His expertise includes tort liability caps, legal ethics and professional responsibility, transit system security, and labor issues. He received a law degree from the Cecil C. Humphreys School of Law at Memphis State University and a bachelor's degree from Duke University.





STUDIES AND SPECIAL PROGRAMS



Daniel Sperling
Chair
Subcommittee on
Planning and Policy
Review



Thomas R. Menzies
Acting Director
Studies and Special
Programs

THE STUDIES AND SPECIAL PROGRAMS

Division conducts studies examining complex and controversial transportation issues at the request of the U.S. Congress, executive branch agencies, states, and other sponsors. Studies address a variety of safety, economic, environmental, energy, and research policy issues affecting all modes of transportation. In addition, studies involving TRB's Marine Board examine offshore engineering and regulatory issues not directly related to transportation.

The studies are performed by special committees drawn from the nation's leading experts. TRB's parent organization, the National Academies of Sciences, Engineering, and Medicine, appoints the study committees to achieve a balance of expertise and perspectives. The TRB Executive Committee's Subcommittee on Planning and Policy Review provides oversight for TRB's

portfolio of policy studies, under the leadership of former Executive Committee Chair Daniel Sperling, University of California at Davis.

The study committees issue their findings and recommendations in full-length reports or shorter letter reports, which are peer-reviewed according to institutional procedures. The U.S. Congress and the executive branch have adopted many recommendations from TRB policy reports, attesting to the substantive value of the study process. Since 1998, all completed reports are posted on the TRB website.¹

Completed Reports

The following reports were issued during 2017:

■ *In-Service Performance Evaluation of Guardrail End Treatments*

Special Report 323 recommends a research design for evaluating the in-service performance of guardrail end treatments and provides advice on the required data and next steps for these evaluations. Highway agencies install many types of guardrail end treatments intended to absorb energy in a crash and to redirect the vehicle into a safe trajectory. The safety of these treatments is evaluated by crash tests, according to standards developed by the American Association of State Highway and Transportation Officials (AASHTO); however, crash testing cannot reproduce the



Members of the Subcommittee on Planning and Policy Review met in October to identify transportation issues and to develop opportunities for new Executive Committee initiatives.

¹ www.trb.org/Publications/PubsPolicyStudiesSpecialReports.aspx

many characteristics—crash dynamics, sites, and installations—that affect crash outcomes.

The report concludes that state highway agencies will require more information about the benefits, costs, and practicality of routine in-service evaluation of end treatments in general before deciding whether to deploy the new data collection and analysis programs necessary to carry out more challenging analyses. The committee that prepared the report recommends research to advance the practice and to test the feasibility and costs of more complex evaluations. Also recommended in the report is research to examine whether the procedures for testing device performance should be altered. The National Cooperative Highway Research Program funded the study.

■ **Designing Safety Regulations for High-Hazard Industries**

Safety failures in high-hazard industries can lead to multiple deaths and injuries, environmental damage, and property loss. To prevent such catastrophic outcomes, governments in the United States and abroad regulate the safety of such industries as pipeline transportation, chemical manufacturing, and offshore oil and gas development. Although these safety regulations often are scrutinized after a major incident, it is inherently difficult to assess the effectiveness of regulations whose purpose is to reduce already-rare catastrophic failures. Nevertheless, regulators of high-hazard industries must have an informed and reasoned basis for their regulatory design choices.

Special Report 324 examines the factors that warrant consideration by regulators of high-haz-



Regulatory designs for high-consequence, low-frequency events in high-hazard industries, particularly those that affect the environment, are examined in Special Report 324, *Designing Safety Regulations for High-Hazard Industries*. (Photo: Louisiana Governor's Office of Homeland Security and Emergency Management)

ard industries in choosing among regulatory design types. Concern over catastrophic failures has caused many regulators to supplement traditional regulations targeting individual risk factors with requirements that operators establish firm, facility-specific safety management systems. These requirements often are justified on the grounds that regulators cannot know—much less target in a uniform manner—all of the risks that may arise in complex, diverse industrial activities.

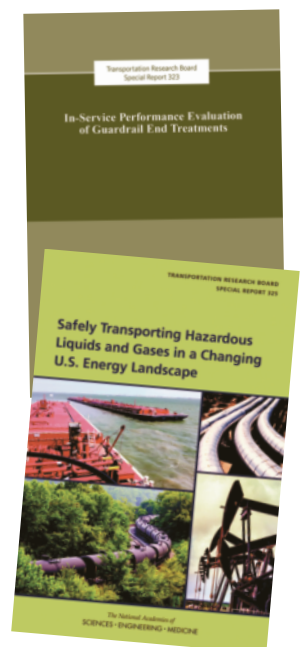
Drawing on case studies from the pipeline and offshore oil and gas industries, the report addresses the implementation challenges associated with different regulatory designs, including those associated with the industry's compliance capabilities and regulators' enforcement capabilities. The report's findings and advice apply broadly to transportation safety regulators as well as to regulators of other high-hazard industries. The project was funded by the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA).

■ **Safely Transporting Hazardous Liquids and Gases in a Changing U.S. Energy Landscape**

Special Report 325 reviews the response of the U.S. pipeline, rail, and barge industries to the marked increase in the domestic production of crude oil, fuel ethanol, and natural gas. The growing demand since 2005 to move these new energy supplies economically and safely from new



Special Report 323, *In-Service Performance Evaluation of Guardrail End Treatments*, offers guidance for highway agencies in selecting, maintaining, and replacing guardrail end treatments. (Photo: Arizona DOT)





Oil spill off the coast of New Orleans. Special Report 325, *Safely Transporting Hazardous Liquids and Gases in a Changing U.S. Energy Landscape*, offers recommendations on safely transporting oil and gas and developing effective responses for emergency incidents. (Photo: Defense Video and Imagery Distribution System)

origins, across new routes, and by new means of conveyance was largely unanticipated by transportation providers and the federal authorities that regulate the safe transportation of hazardous goods. The vast majority of these hazardous liquids and gas shipments are transported without incident; however, the severe consequences resulting from some incidents have attracted the attention of the public and of policymakers intent on preventing similar events in the future.

By sponsoring this study, TRB's Executive Committee sought a review and comparison of how the pipeline, rail, and barge industries have fared in safely transporting the new traffic in domestic energy liquids and gases. The study committee performed a comparative review of the safety assurance systems in each of the three long-distance modes, as well as of efforts to strengthen the response capacity for emergencies that do occur. In the spirit of developing a safety assurance and emergency response capability that is even more robust in the face of possible future safety challenges, the report offers many recommendations to PHMSA and the Federal Railroad Administration.

■ **Acquisition and Operation of Polar Icebreakers: Fulfilling the Nation's Needs**

For more than 30 years, studies have revealed a need for polar icebreakers to fulfill the U.S. Coast

Guard's statutory missions and to meet other national goals. These studies have indicated ever-widening gaps in the ability of the United States to meet its statutory obligations, protect its interests, and maintain leadership in the world's high-latitude regions. A U.S. presence in high-latitude regions requires reliable, year-round access to support economic interests, search and rescue needs, defense and security readiness, en-



The technologically advanced polar icebreaker USCGC *Healy* facilitates Arctic research, search and rescue, and enforcement of laws and treaties. In July, the Committee on Polar Icebreaker Cost Assessment released a letter report to Congress recommending four more icebreakers for polar regions. (Photo: Merideth Manning, U.S. Coast Guard)

vironmental protection, maritime mobility, and scientific research. In the Antarctic, the country maintains three year-round research facilities and verifies compliance with international treaty obligations—duties that require icebreaking in all seasons.

In the Coast Guard Reauthorization Act of 2015, Congress requested a study of alternative strategies for minimizing the costs incurred by the federal government in procuring and operating heavy polar icebreakers. In a letter report to Congress, a special TRB and Marine Board committee appointed by the National Academies recommended building four heavy polar icebreakers and proposed an acquisition strategy. The committee concluded that the first three heavy icebreakers would fulfill the U.S. Coast Guard's need to provide a continuous presence in the Arctic and that the fourth heavy icebreaker could perform the annual breakout of McMurdo Station in Antarctica. The report also identified and recommended additional short-term actions that the U.S. Coast Guard can take to improve the nation's polar icebreaking capacity.

■ **Review of the Department of Transportation Testing and Analysis Results for Electronically Controlled Pneumatic Brakes**

In response to a congressional request, a special TRB committee was convened to review and provide advice on the U.S. Department of Transportation's (DOT's) plan to test the assumptions underlying its comparisons between the emergency braking performance of electronically controlled pneumatic (ECP) brakes on railroad tank cars and the performance of conventional braking systems. Congress required U.S. DOT to conduct physical tests and related analyses to inform a mandated review and reconsideration of the ECP braking system requirements in the *Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains* final rule.

The committee issued an initial letter report that reviewed U.S. DOT's testing plans and a second letter report, based on U.S. DOT's test results and analysis, with findings and recommendations about the conduct of the tests and analysis. The first report recommended specific field and laboratory tests to be considered and steps for U.S. DOT to take in validating its results. In the second report, the committee reviewed U.S. DOT's efforts to validate its model and its simulation approach.



Thomas Deen (*far left*) addresses a meeting of the Committee to Review Evidentiary Protection for Public Transportation Safety Program Information.

Ongoing Studies

- **Future of the Interstate Highway System**, initiated at the request of Congress and funded by the Federal Highway Administration (FHWA), will provide advice on the future role of—and funding options for—the Interstate Highway System.
- **Evidentiary Protection of Transit Safety Information**, requested by Congress and funded by the Federal Transit Administration (FTA), is examining whether information about public transportation safety should be protected from litigation in the same way that certain highway safety information is protected.
- **Review of the Innovative Bridge Research and Construction Program**, called for in the Fixing America's Surface Transportation (FAST) Act and funded by FHWA, is examining the utility and promise of the technologies and construction techniques examined as part of the federally funded bridge research program.
- **Regulating Small Propane Pipe Installations**, called for in the Protecting our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act and sponsored by PHMSA, is reviewing the cost-benefit trade-off of reducing the federal oversight of small propane pipe systems.
- **Truck Size and Weight Research Road Map**, sponsored by FHWA, will develop and recommend a research roadmap to address gaps and uncertainties in estimating the impacts of changes in truck size and weight limits.



As the use of electric vehicles increases, state DOTs begin to address funding for charging stations. (Photo: Mateo Malo, Flickr)

Other committees provide ongoing peer review of the research and technology programs of FHWA and FTA, as well as major FHWA research activities, such as the Long-Term Infrastructure Performance Program. The committees that review these programs issue letter reports, available on TRB's website.²

² www.trb.org/Publications/PubsPolicyStudiesLetterReports.aspx

Assistance in National Academies Studies

In addition, Policy Studies staff assisted the National Academies' Board on Energy and Environmental Systems on projects evaluating fuel conservation technologies for heavy-duty trucks for the National Highway Traffic Safety Administration and a study of options for funding electric vehicle recharging stations for the U.S. Department of Energy.

TRB also assisted the Committee on National Statistics in a study requested by Congress and funded by the Federal Motor Carrier Safety Administration (FMCSA) to review FMCSA's Compliance, Safety, and Accountability program.

Staff News

Stephen R. Godwin stepped down as Division Director to work part-time on studies. Deputy Director **Thomas R. Menzies** was named Acting Division Director.

Senior Administrative Assistant **Amelia Mathis** retired after nearly 25 years of service at the National Academies, including 16 years with TRB. She assisted with dozens of studies and was responsible for general administration of the division.

Michael Covington joined the Policy Studies group as Senior Program Assistant.

COOPERATIVE RESEARCH PROGRAMS



TRB ADMINISTERS SIX cooperative research programs:

- The National Cooperative Highway Research Program (NCHRP), sponsored by the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration (FHWA);
- The Transit Cooperative Research Program (TCRP), sponsored by the Federal Transit Administration (FTA);
- The Airport Cooperative Research Program (ACRP), sponsored by the Federal Aviation Administration (FAA);
- The National Cooperative Freight Research Program (NCFRP), sponsored by the Office of the Assistant Secretary for Research and Technology (OST-R);



NCHRP manager Lori Sundstrom provides project and funding updates to the AASHTO Special Committee on Research and Innovation at its spring meeting.

- The Hazardous Materials Cooperative Research Program (HMCRP), sponsored by the Pipeline and Hazardous Materials Safety Administration (PHMSA); and
- The National Cooperative Rail Research Program (NCRRP), sponsored by the Federal Railroad Administration (FRA).

National Cooperative Highway Research Program

A forum for coordinated and collaborative research, NCHRP addresses issues integral to the functions of state departments of transportation (DOTs) and to the work of transportation professionals at all levels of government and private practice. Since 1962, NCHRP has helped the transportation community find practical solu-



Cooperative Research Programs (CRP) Director Christopher J. Hedges updates the Executive Committee on CRP projects and initiatives. (Photo: Risdon Photography)



Brian Ness
Chair
AASHTO Special
Committee on
Research and
Innovation



Paul Jablonski
Chair
TCRP Oversight and
Project Selection
Committee



Kitty Freidheim
Chair
ACRP Oversight
Committee



**Christopher J.
Hedges**
Director
Cooperative
Research Programs

tions to pressing problems and develop and apply innovations to improve current practices. The AASHTO Special Committee on Research and Innovation (R&I) serves as the governing board for NCHRP.

Support for NCHRP comes from voluntary contributions from the state DOTs. NCHRP's close association with AASHTO and its position within the National Academies of Sciences, Engineering, and Medicine have enabled the program to carry out research with sound, practical, and nationally important results. Stakeholder involvement throughout the NCHRP process guarantees that the program addresses high-priority research needs and develops products that are ready for implementation by transportation practitioners.

NCHRP manages projects in research areas that range from highway and bridge planning, materials, design, construction, and operations, to economics and finance, policy, land use, environmental issues, and workforce development. The results of these research projects have appeared in 1,422 publications in the NCHRP Research Report and NCHRP Synthesis of Highway Practice series, in addition to 401 Research Results Digests and 75 Legal Research Digests, as well as 316 other documents published electronically.

AASHTO selected 16 continuing projects and 43 new projects in 2017. Each NCHRP project follows an approved research plan under the guidance of a panel of technical specialists and experienced practitioners. The panel defines the scope of work, selects the contractor through a competitive proposal process, and monitors the research from beginning to end. The panel's participation ensures the credibility of the research findings, facilitating adoption by AASHTO, state DOTs, and other organizations.

NCHRP panels convened for more than 163 project meetings in 2017; more than 2,346 vol-

unteers offered their time, energy, and expertise as panel members, attending meetings and reviewing materials, primarily for the challenges and the satisfaction of making contributions to the field. Most NCHRP research projects have recommended specifications and produced manuals and guidelines that have had a direct impact on practice, and the program often partners with AASHTO to ensure that the state DOTs learn about and deploy the products. Examples of NCHRP successes can be found in the *Impacts on Practice* series.¹

HIGHLIGHTS OF 2017

Connected and Automated Vehicles

With the rapid development and deployment of connected and automated vehicle (CAV) technologies, state DOTs need research on the effects of these technologies and on preparing for their widespread use. NCHRP Report 845, *Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Agencies*, can assist agencies in exploring actions to increase the likelihood that CAV technology will have beneficial impacts on traffic crashes, congestion, pollution, land development, and mobility—particularly for older adults, youths under age 16, and individuals with disabilities.

Related research under way addresses challenges for truck freight operations, strategic communications planning, road markings for machine vision, implications for motor vehicle codes, dedicated and priority-use lanes, incor-

¹ www.trb.org/nchrp/nchrpimpactspractice.aspx



Kathi Grasso, Director of the Committee on Law and Justice of the National Academies of Sciences, Engineering, and Medicine, shares legal and policy expertise with fellow members of the NCHRP panel on State Department of Transportation (DOT) Contributions to Study, Investigation, and Interdiction of Human Trafficking.



In October 2017, the Governors Highway Safety Association entered into agreement with TRB to manage the Behavioral Traffic Safety Cooperative Research Program (BTSCRCP). Among the areas of emphasis are alcohol-impaired driving, autonomous vehicles, bicyclists and pedestrians, child passenger safety, speed and red light cameras, and law enforcement. BTSCRCP is funded through a \$2.5 million grant each federal fiscal year through the Moving Ahead for Progress in the 21st Century Act.



NCHRP Project 20-113 focuses on how transformational technologies like bicycle sharing are changing the role of DOTs. (Photo: Nick Falbo, Flickr)

porating CAV impacts into regional transportation planning and modeling tools, cybersecurity implications, effects on travel demand, business models for deploying infrastructure, data needs and collection, and data management strategies for operations.

Research Roadmaps

Research roadmaps in three critical strategic areas were developed in 2017: transportation and public health, transformational technologies other than CAVs, and freight transportation. The roadmaps outline the key issues in an area, identify research gaps that constrain effective decision making, and determine specific research projects needed to address these gaps.

■ **Research Roadmap for Transportation and Public Health, NCHRP Project 20-112.** Society relies on efficient and effective transportation to move people and goods, create personal mobility, and improve quality of life. Transportation systems, however, can affect public health through air quality, safety, noise, and incentives or disincentives for physical activity. To develop strategic goals and objectives, transportation agencies need to understand the complex relationship between transportation and public health.

■ **Research Roadmap for Transformational Technologies Other than CAVs, NCHRP Project 20-113.** Transformational, or disruptive, technologies can be expected to displace the status quo and permanently change the way people live and

work. Examples in transportation include CAVs; bicycle sharing in urban centers; carsharing services, such as Car2Go and Zipcar; on-demand shared ride services, such as Uber and Lyft; hybrid and other alternative-fueled vehicles; and drones, e-retailing, and 3-D printing. Each of these is the focus of extensive research; collectively, these technologies will change the nature and role of the future DOT. Transformational technologies will affect the planning, building, operation, and maintenance of transportation systems. Recognizing the impacts of transformational technologies can help transportation agencies to foster strategic goals and objectives.

■ **Multimodal Freight Transportation Research Roadmap, NCHRP Project 20-114.** As outlined in *Beyond Traffic*, the U.S. DOT's 30-year plan, the nation's ability to compete in global markets—and to meet the needs and expectations of consumers and industry—depends on a robust, multimodal freight transportation system. The U.S. freight system is under strain; roads, railways, and some airports are increasingly congested. Many ports and inland waterways require dredging, and facilities are aging. Nevertheless, freight volume is projected to increase 45 percent by 2045. Transportation agencies need to understand the current and anticipated trends in the freight transportation network to develop strategic goals and objectives.

IMPLEMENTATION PLANNING

NCHRP uses the National Implementation Research Network's definition of implementation: "a specified set of activities designed to put into practice an activity or products of known dimen-



New automotive technology can offer significant mobility benefits for older adults, as well as drivers under the age of 16 and individuals with disabilities. (Photo: GM)



Multimodal freight transportation systems, like this one in Jacksonville, Florida, are experiencing increased volume and aging facilities. (Photo: Jaxport, Flickr)



sions.” In recent years, R&I has prioritized the implementation process—developing products in different formats for different target audiences, engaging stakeholders through workshops and peer exchanges, and conducting demonstrations of research products at sponsoring agencies. Since 2015, R&I has made \$2 million available annually to fund requests for communication and implementation activities from NCHRP project panels, state DOTs, and AASHTO committees.

The NCHRP implementation program has three main elements: (1) targeted communication and dissemination of research results, (2) administration of implementation projects for specific research products, and (3) tracking the use of research products and assessing their impact. NCHRP hired a full-time implementation coordinator in October 2017.

RESEARCH RESULTS

Following is a sample of the NCHRP reports published in 2017 that have particular importance to AASHTO. All reports are available on the TRB website.² General information on all projects is

available in the NCHRP Annual Report, December 31, 2017,³ and on the web.

Administration

NCHRP Report 867, *Keeping What You Paid For—Retaining Essential Consultant-Developed Knowledge Within DOTs*, and Web-Only Document 238, *Developing the Guide to Retaining Essential Consultant-Developed Knowledge Within DOTs*.

Connected and Automated Vehicles

NCHRP Report 845, *Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Agencies*.

Design

- NCHRP Report 839, *A Performance-Based Highway Geometric Design Process*, and
- NCHRP Legal Research Digest 74, *Liability of State Departments of Transportation for Design Errors*.

Environment

- NCHRP Report 840, *A Watershed Approach to Mitigating Stormwater Impacts*, and
- NCHRP Legal Research Digest 75, *Legal Requirements for State Transportation Agency Participation in Conservation Plans*.

Freight

NCHRP Report 854, *Guide for Identifying, Classifying, Evaluating, and Mitigating Truck Freight Bottlenecks*.

Pavements and Materials

NCHRP Report 859, *Consequences of Delayed Maintenance of Highway Assets*.

Planning

- NCHRP Report 844, *Guide for Integrating Goods and Services Movement by Commercial Vehicles in Smart Growth Environments*, and
- NCHRP Report 861, *Best Practices in Rural Regional Mobility*.

Project Delivery

NCHRP Report 850, *Applying Risk Analysis, Value Engineering, and Other Innovative Solutions for Project Delivery*.

² www.trb.org/Publications/PubsTRBPublicationsbySeries.aspx.

³ www.trb.org/Main/Blurbs/176976.aspx



K. Jane Williams, Deputy Administrator, Federal Transit Administration, participates in the TCRP Oversight and Project Selection Committee, which met in October.

Traffic Management

NCHRP Synthesis 507, *Traffic Signal Preemption at Intersections near Highway–Rail Crossings*.

Safety and Security

NCHRP Web-Only Document 233, *Mainstreaming Transportation Hazards and Security Risk Management: CAPTA Update and Implementation*.

Transit Cooperative Research Program

In 2017, TCRP marked 25 years of service through research. Initially authorized by the Intermodal Surface Transportation Efficiency Act and initiated under TRB management in July 1992, TCRP is supported by annual grants from the Federal Transit Administration (FTA).

The TCRP Oversight and Project Selection (TOPS) Committee selects research for the program; the committee also serves as a subcommittee of the board of directors of the Transit Development Corporation (TDC), a nonprofit educational and research affiliate of APTA. A three-way memorandum of agreement by FTA, TDC, and TRB outlines the program’s operating procedures. In its 25 years, TCRP has undertaken more than 700 research studies. Details on the program’s progress since 1992 can be found in the 2017 TCRP Annual Report of Progress.⁴

The current surface transportation authorizing legislation—the Fixing America’s Surface Transportation (FAST) Act—passed in December

⁴ <http://www.trb.org/Main/Blurbs/176943.aspx>

2015 and reauthorized TCRP for 5 years from Fiscal Year (FY) 2016 through FY 2020 at \$5 million per year. The FAST Act also consolidated TCRP, moving it from 49 U.S.C Chapter 53, Section 5313, as a stand-alone section, into Section 5312, Public Transportation Innovation, and changed its funding source from the General Fund to the Mass Transit Account of the Highway Trust Fund.

TCRP produced 17 publications in 2017, bringing the total to more than 654 since the program’s inception. The following TCRP publications of particular interest were completed during the year.

OPERATIONS AND SAFETY

■ TCRP Research Report 189, *Manual to Improve Rail Transit Safety at Platform/Vehicle and Platform/Guideway Interfaces*, is a resource for transit agencies to improve safety at rail transit platform-and-guideway and platform-and-vehicle interfaces. Based on a literature review, site visits to rail transit agencies, incident data analysis, and conversations with transit industry members, the manual provides treatment strategies to prevent incidents and improve safety at these interfaces. The report focuses on rail transit systems in which the vehicle floors are level or near level with the platform.

■ TCRP Synthesis Report 124, *Planning and Design for Fire and Smoke Incidents in Underground Passenger Rail Systems*, documents state-of-the-practice information of the planning, design, and operations for passenger rail systems in the event of fire and smoke incidents in underground or



TCRP Synthesis 124, *Planning and Design for Fire and Smoke Incidents in Underground Passenger Rail Systems*, examines practical emergency practice and provides case studies.



TCRP Research Report 189, *Manual to Improve Rail Transit Safety at Platform/Vehicle and Platform/Guideway Interfaces*, shares research particular to level-platform interfaces. (Photo: Koemu, Flickr)



Research on the spread of infectious diseases through travel is tackled in TCRP Legal Research Digest 50, *Public Transit Emergency Preparedness Against Ebola and Other Infectious Diseases: Legal Issues*. (Photo: Cory Doctorow, Flickr)

enclosed conditions. The report identifies current practices, lessons learned, challenges, and gaps in information. Case studies provide additional details on procedures, evacuation, and keys to success as perceived by transit agencies.

ADMINISTRATION

TCRP Research Report 191, *Public Transportation Guidebook for Small- and Medium-Sized Public-Private Partnerships (P3s)*, is a resource for public transportation agencies, local governments, the private sector, and others interested in small- and medium-sized P3s for public transportation projects. Relevant to all public transportation modes, the guidebook includes eight case studies on small- and medium-sized P3s from across the United States and addresses P3s for capital improvements, operations and maintenance, real estate, marketing agreements, and innovative technology.

POLICY AND PLANNING

TCRP Research Report 192, *Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation: Guidebook on Planning and Managing Park-and-Ride*, offers guidance to public transportation agencies in the development of park-and-ride facilities, from concept through operation. Presented in this guidebook is information about best practices and lessons learned, gleaned from a literature review, industry scan, and detailed case studies from transit agencies in the United States and Canada. The



In 2017, TCRP released Research Report 191, *Public Transportation Guidebook for Small- and Medium-Sized Public-Private Partnerships (P3s)*.

report was the lead research product from TCRP Project H-52, Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation.

LEGAL

TCRP Legal Research Digest 50, *Public Transit Emergency Preparedness Against Ebola and Other Infectious Diseases: Legal Issues*, examines responses to infectious disease epidemics and identifies legal issues that transit agencies may encounter: closures of public facilities, businesses, and other major traffic generators; checkpoints for screening; quarantine zones; compulsory leave for possibly infected employees; employees who refuse to come to work; prescreening of passengers; and full or partial suspension of service. The study evaluates privacy and civil rights of patrons and employees, as well as liability issues.

Considered in this volume are the federal and state laws and available court decisions affecting transit agencies' responses to infectious disease outbreaks, and the potential cohesiveness of transit agencies' procedures and federal and state guidance. Legal Research Digest 50 examines the legal basis for the protocols that public transit agencies—and other transportation providers such as airlines—have planned or implemented to respond to epidemics and pandemics, and reviews pertinent information from leading agencies and organizations, such as the Centers for Disease Control, the U.S. Department of Homeland Security, and the World Health Organization, to ascertain what procedures transit agencies should have in place before and during an epidemic.

Airport Cooperative Research Program

The world is more interconnected than ever before. Political, economic, environmental, and



ACRP manager Mike Salamone leads a discussion at a meeting of the ACRP Oversight Committee in July.

technological developments in the United States are felt around the globe and underscore the global and interdependent nature of business. For the airport industry—especially for well-informed airport practitioners—this new reality translates into a bright future.

Established in 2006, sponsored by FAA, and managed by TRB, ACRP is an applied research program that helps the airport industry respond to global challenges and opportunities by cultivating and strengthening its own interconnections. Offering more than 400 publications, compelling and well-attended events, and a series of engaging initiatives, ACRP fosters the exchange of knowledge and best practices among the airport industry. Its programs encourage collaborating to address shared challenges, professional networking across distance and generations, and identifying and addressing emerging challenges with timely information and tools.

To date, ACRP has directed millions of dollars to fund more than 500 research projects spanning the full spectrum of disciplines at airports, including airport design, construction, sustainability, finance, law, maintenance, operations, safety, policy, planning, human resources, and administration. Each research project addresses a specific industry need identified by public- and private-sector stakeholders—including airport practitioners, academics, consultants, advocates, and students—and is guided by a panel of subject-matter experts. The research findings fill gaps in knowledge and practice, address persistent problems, identify best practices, and offer practical tools to help practitioners overcome common and emerging challenges. ACRP research is published and posted online in diverse formats, such as reports, guidebooks, legal digests, syntheses of research, and more.

ACRP IDEA HUB

Airport practitioners look to ACRP to provide tools and knowledge that help them solve airport problems and anticipate opportunities and threats. In turn, ACRP looks to these practitioners to provide ideas, or problem statements, that can become research projects.

To encourage more effective participation from a broader swath of the airport and aviation industries, in 2017 ACRP created IdeaHub, a user-friendly, web-based tool that serves as a central research idea portal.

On IdeaHub, anyone can register and sub-



ACRP's IdeaHub is a web-based tool that allows individuals to share problems, pose questions, and suggest ways research can improve airports and industry practitioners.

mit an idea for a problem statement, monitor its progress from submission through review, and connect with experts to help refine and strengthen statements. The streamlined process also allows unfunded statements to be reconsidered for future refinement and funding; all statements and ACRP Oversight Committee guidance remain in the system.

How IdeaHub Works

Practitioners begin by submitting their idea via the “Idea Collection” screen. Users then are guided through several phases—comment, review, refine, and response—before the final stage, in which the idea is ready for formal evaluation and selection by the oversight committee as a problem statement. Any problem statements that do not receive funding are returned to the collection to repeat the process at a future date, to receive further refinement and possible funding.

IdeaHub provides simple, additional opportunities for practitioners to get involved and collaborate on problem statements, which can lead to improvements in the aviation industry at all levels. Its easy-to-use interface engages idea authors and owners, subject-matter experts, topic mentors and moderators, reviewers and estimators, and members of the ACRP Oversight Committee.

Now Live

To ensure IdeaHub's functionality in the problem statement development process, ACRP road-tested the program in beta form for several months before launching it to the airport industry. IdeaHub now is live, in use, and ready for anyone interested in participating in ACRP.



The five volumes in ACRP Report 150, *NextGen for Airports*, explore the new technologies and procedures used in air traffic control. (Photo: Ames Dominic Hart, NASA)

To sign up as a user or to read more information about IdeaHub, visit www.trb.org/acrp.

NEXTGEN FUTURE

To facilitate the understanding, navigation, and deployment of airspace and air traffic control center best practices, new technologies, and optimal procedures—known collectively as NextGen—ACRP completed a \$2 million initiative to publish ACRP Report 150: *NextGen for Airports*, a five-volume set of interrelated research products, guidebooks, and reports. These reports are coordinated in scope, offering vital information to airport operators, CEOs, planners, and members of the public about how and why to implement NextGen. ACRP Report 150 comprises the following titles:

- *Volume 1: Understanding the Airport's Role in Performance-Based Navigation: Resource Guide;*
- *Volume 2: Engaging Airport Stakeholders—Guidebook;*
- *Volume 3: Resources for Airports;*
- *Volume 4: Leveraging NextGen Spatial Data to Benefit Airports—Guidebook; and*
- *Volume 5: Airport Planning and Development.*

The reports are available to download for free from ACRP's website; a complete NextGen public information toolkit will be available online.

TIMELY RESEARCH UPDATES

Throughout 2017, ACRP's webinar series has informed and engaged airport practitioners, in-

cluding presentations on such topics as safety management system approaches for wildlife hazard management at airports, security screening, understanding aircraft deicers and their impact on stormwater runoff, and advancing collaborative decision making at airports. Each webinar attracted an average of 150 attendees from 47 states and abroad. Ninety-two percent of users reported that they were satisfied or very satisfied with the quality of the webinars—a standard that ACRP established and has consistently met for five years.

ACRP has investigated how practitioners use these reports and concluded that the most popular application of the reports is as guidance tools. The volumes commonly are used to help inform management decisions, change standards and guidance documents, and shape policy changes.

Through engagement with stakeholders and a well-established research process, ACRP provides the airport community with relevant, valuable guidance and tools to help practitioners successfully manage their daily operations, avoid potential threats, and leverage new opportunities for growth and innovation.



National Cooperative Freight Research Program

Authorized in 2005 under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), NCFRP is sponsored by OST-R and managed by TRB. An oversight committee comprising a representative cross section of freight stakeholders provides program guidance. Annual funding averaged \$3.4 million during SAFETEA-LU, but the Moving Ahead for Progress in the 21st Century Act (MAP-21) repealed NCFRP.

Although the program will be closing down, all research activity funded through FY 2012 will be completed as planned.

Hazardous Materials Cooperative Research Program

SAFETEA-LU authorized a pilot cooperative research program on hazardous materials transportation. HMCRRP was initiated in September 2006 under the sponsorship of PHMSA to complement other U.S. DOT research efforts as a stakeholder-driven, problem-solving program, funding research on real-world, day-to-day operational issues with near- to midterm time frames. Annual funding averaged \$1.1 million, but MAP-21 did not provide funding beyond FY 2012.

National Cooperative Rail Research Program

Authorized by the Passenger Rail Investment and Improvement Act of 2008, NCRRP started up under TRB management in 2012 with the sponsorship of FRA. The program has carried out applied research on intercity rail, intermodal efficiency, capacity, interconnectivity, high-speed rail corridors, and passenger and freight transportation. One year of funding was provided at \$5 million. NCRRP released all remaining publications before the end of 2016; the program has not been reauthorized.

Synthesis of Practice and IDEA Programs

An internal restructuring in 2017 transferred these programs from the Studies and Special Projects Division to the Cooperative Research Programs Division.

SYNTHESIS PROGRAMS

Under the sponsorship of the Cooperative Research Programs administered by TRB—specifically ACRP, NCHRP, and TCRP—the Synthesis Programs unit prepares reports on current practice and knowledge on a range of key airport, highway, and transit topics. Practitioners and researchers make extensive use of the reports.

An airport panel, a highway panel, and a transit panel select the study topics each year. In 2017, 10 new airport, 15 new highway, and seven new transit studies started up. A consultant experienced in the topic area researches and writes each synthesis report, with guidance from an expert panel.

A list of synthesis reports published in the past 12 months appears on pages 55–56. Approximately 1,000 copies of each ACRP and NCHRP synthesis are published in hard copy, with 600 to 700 distributed to state DOTs, airport operators, and TRB topic-area subscribers. Since 2014, TCRP has published syntheses on the TRB website only; ACRP and NCHRP syntheses are also available on the website. TRB maintains an inventory of hard-copy synthesis reports for sale.

IDEA PROGRAMS

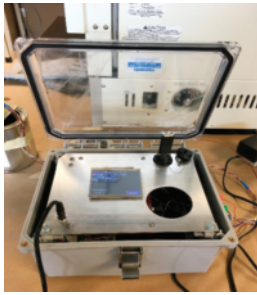
IDEA programs fund early-stage investigations of potential breakthroughs in transportation technology. Through small projects, researchers investigate the feasibility of innovative concepts that could advance transportation practice. IDEA programs sponsor high-risk research that is in-



NCHRP syntheses addressed such topics as the selection and design of roundabouts. (Photo courtesy City of Shakopee, Minnesota)



ACRP webinars in 2017 covered such topics as stormwater runoff, deicing, and terminal concessions. (Photo: Mack Lundy, Flickr)



Duomorph asphalt rheology tester (top) and test setup (bottom). Developed under NCHRP IDEA Project 193, the low-cost, piezoelectric sensor-based portable testing system monitors the quality and specification compliance of asphalt binder samples at various points along its supply chain. (Photos: Cooperative Research Programs)

dependent of the immediate mission concerns of public agencies and of the short-term financial imperatives of the private sector.

Three IDEA programs were operating in 2017:

- NCHRP IDEA, collectively funded by the state DOTs, for highway-related research;
- Transit IDEA, funded by FTA through TCRP, for research on innovations applicable to transit practice; and
- Rail Safety IDEA, sponsored by FRA, for projects to improve the safety of railroad operations.

Each IDEA program follows a similar administrative model, adapted for sponsorship arrangements and target audiences. Each program operates through a committee or panel of volunteer transportation experts who solicit, review, and select proposals that merit research contracts. Funds awarded for any one project range between \$50,000 and \$150,000. Frequently, however, the funds are augmented through cost-share arrangements, nearly doubling the amount of research that can be supported through the IDEA programs.

At the 2017 TRB Annual Meeting, the transit, highway, and safety programs conducted poster sessions highlighting 28 of the most promising current projects. Each session attracted a constant stream of interested visitors, who interacted directly with the inventors.

The following section lists recently completed IDEA projects. Each of the IDEA programs publishes an annual report that includes summaries of completed and current projects. The summaries also are posted on the IDEA page of the TRB website, along with the IDEA program an-



Elham (Ellie) Fini, principal investigator of Highway IDEA Projects 171 and 194, developing bioasphalt from swine manure, was selected to be an AAAS-Lemelson Invention Ambassador. (Photos: Cooperative Research Programs)



In October, TCRP Manager Gwen Chisholm Smith (second from left) received a proclamation from APTA recognizing the 25th anniversary of the transit research program.

nouncement, which contains forms and guidelines for submitting proposals. Contractor final reports for completed IDEA projects are posted on the TRB website.

Dr. Ellie Fini of North Carolina A&T State University was selected by the American Association for the Advancement of Science under its AAAS-Lemelson Invention Ambassadors Program for her IDEA research (Highway IDEA Project 171) on developing bioasphalt from swine manure. She was one of eight individuals selected this year whose innovative work was judged to be important in “bettering our quality of life and building strong economies.”

RECENTLY COMPLETED IDEA PROJECTS

- **Highway IDEA Project 174:** Enhanced Performance Zinc Coating for Steel in Concrete
- **Highway IDEA Project 175:** Rapid Detection of Fatigue Cracking in Steel Anchor Rods Using the Impulse Response Method
- **Highway IDEA Project 176:** Contactless Electrode for Fast Survey of Concrete Reinforcement Corrosion
- **Highway IDEA Project 179:** Development of a Portable Total-Stress Measurement Instrument for Steel Bridges
- **Highway IDEA Project 181:** Development of a Small Specimen Geometry for Asphalt Mixture Performance Testing
- **Highway IDEA Project 182:** Reducing Stormwater Runoff and Pollutant Loading with Biochar Addition to Highway Greenways
- **Highway IDEA Project 184:** Synthetic Household Travel Data Using Consumer and Mobile Phone Data

- **Rail Safety IDEA Project 25:** Dynamic Impact Factors on Existing Long Span Truss Railroad Bridges
- **Rail Safety IDEA Project 26:** Remote Sensing with Mobile LiDAR and Imaging Sensors for Railroad Bridge Inspections
- **Rail Safety IDEA Project 27:** Field Evaluation of Ballast Fouling Conditions Using Machine Vision
- **Rail Safety IDEA Project 28:** Field Validation of Inspection Gauges for Wheel Climb Safety at Switch Points
- **Transit IDEA Project 79:** Implementation of Smart Card Automatic Fare Collection (AFC) Technology in Small Transit Agencies for Standards Development
- **Transit IDEA Project 80:** Enhancing Safety and Security of Transit Systems Using Computer Vision
- **Transit IDEA Project 82:** Active Safety-Collision Warning Pilot in Washington State

Staff News

Lori Sundstrom was appointed Manager of NCHRP and Deputy Director of Cooperative Research Programs.

Gwen Chisholm Smith was appointed Manager of TCRP.

Program Officer **Velvet Basemera-Fitzpatrick** moved to CRP from the Studies and Special Programs Division.

Camille Crichton-Summers and **Ann M. Hartell** joined CRP as Senior Program Officers.

Sid Mohan was hired as NCHRP's new Implementation Coordinator.

Natassja Linzau returned to CRP as Web Developer.

Senior Project Assistant **Charlotte Thomas** retired from TRB.

Scott Hitchcock was promoted to Senior Editor.

Senior Editor **Linda A. Dziobek** moved to CRP from the Executive Office.

Heidi Willis joined CRP as Editor.

Editor **Maria Crawford** left TRB to spend more time with her family.

CRP welcomes staff from the Synthesis of Practice and IDEA programs. These include Senior Program Officers **Jo Allen Gause**, **Mariela Garcia-Colberg**, **Gail Staba**, and **Inam Jawed**; Program Coordinator **Deb Irvin**; and Senior Project Assistants **Cheryl Keith** and **Demisha Williams**.

Brittany Summerlin-Azeez has been appointed ACRP Program Coordinator.

Jon Williams and **Don Tippman** retired from TRB.

EXECUTIVE OFFICE



THE TRB EXECUTIVE OFFICE provides policy and operational guidance for programs and activities; oversees committee and panel appointments and report review; supplies staff support to the Executive Committee and the Division Committee; provides support and direction for human resources issues, staffing needs, information technology services, and the TRB Minority Student Fellows Program; develops and directs the Board's communications and outreach efforts; oversees efforts to expand TRB's stakeholder community; operates a bibliographic database of transportation research and provides library reference services; and maintains liaison with the executive offices of the National Academies of Sciences, Engineering, and Medicine, the Board's parent institution. For 2017, the Executive Office also managed the editing, production, design, and publication of many TRB reports, including its journal series, magazine,



TRB Executive Director Neil Pedersen addressed the Executive Committee at the 2017 Annual Meeting in January. (Photo: Risdon Photography)



Tariq Usman Saeed (*left*), Purdue University, serves on two standing committees, on bridge preservation and on statistical methods, as a young member. The Young Members Council and other initiatives aim to broaden the cross section of TRB stakeholders. (Photo: Risdon Photography)

policy studies, and other titles; however, this role will change in 2018 because of a reorganization that will consolidate TRB's publications production activities.

Oversight Activities

The Executive Office supports the work of the TRB Executive Committee, which provides strategic direction to TRB programs and activities in accord with the policies of the National Academies. The Executive Office oversees the implementation of the TRB strategic plan, as approved by the TRB Executive Committee, to pursue the following goals:

1. Develop and implement processes to identify and address emerging and critical transportation issues in a strategic and proactive manner.
2. Involve a broader cross section of stakeholders and constituencies in TRB programs and activities.
3. Conduct strategic reviews of the portfolio of TRB legacy programs and products and introduce activities to meet critical marketplace needs.
4. Apply systematic approaches for identifying and tracking the impacts of TRB's research programs.
5. Strengthen the long-term financial stability of TRB by augmenting traditional federal and federally derived sources of funding.
6. Develop and implement coordinated approaches to communicate information on TRB activities and products that address emerging and critical issues.
7. Provide TRB staff with the knowledge, resources, and tools necessary to meet and exceed the expectations of TRB stakeholders and customers.



Members of the TRB Division Committee for 2017 (left to right): Malcolm Dougherty, Executive Committee Chair; Daniel Sperling, University of California, Davis; Scott Bennett, Arkansas State Highway and Transportation Department; Susan Hanson, Division Committee Chair; Chris Hendrickson, Division Committee Vice Chair; James M. Crites, past Executive Committee Chair; and Neil Pedersen, TRB Executive Director. (Photo: Risdon Photography)

Appointments and Report Review

Oversight of committee and panel appointments and of report review is the responsibility of the TRB Division Committee, formerly the Subcommittee for NRC Oversight, which ensures that TRB meets institutional standards and that its activities are appropriate for the National Academies of Sciences, Engineering, and Medicine. The name now is consistent with the oversight committees of the other divisions in the National Research Council. As part of its oversight, the Division Committee monitors the Board's progress in expanding the participation of minorities, women, and young professionals on TRB committees and panels. Susan Hanson chairs the Division Committee and represents TRB as an ex officio member on the NRC Governing Board. In

2017, Chris Hendrickson was appointed as Vice Chair.

The Executive Office processes the Board's large volume of committee and panel appointments and maintains committee membership records. It also manages the institutional report review process according to established guidelines. This review process, designed to ensure the independent, rigorous review of reports, is a hallmark of the National Academies of Sciences, Engineering, and Medicine.

Minority Student Fellows Program

With support from the U.S. Federal Highway Administration and other organizations, the TRB Minority Student Fellows Program seeks to increase the participation of students of different



Susan Hanson
Chair, Division Committee



Chris Hendrickson
Vice Chair, Division Committee



Neil J. Pedersen
Executive Director



Russell W. Houston
Associate Executive Director



Mark R. Norman
Director, Development and Strategic Initiatives



More than 100 students from minority-serving institutions of higher learning have attended the Annual Meeting through the Minority Student Fellows Program. (Photo: Risdon Photography)

racial and ethnic groups that are underrepresented in the Annual Meeting, on TRB committees and activities, and in transportation research.¹ The program provides expenses for students from select Minority-Serving Institutions to attend the Annual Meeting and present research. Since the program began in 2010, 104 graduate and undergraduate students have participated, with 22 selected for the 2018 Annual Meeting.

Publications

TRB disseminates transportation research results and technical information through an array of publications assessing the state of the practice in specific areas, addressing major national transportation policy issues, and identifying research needs. TRB publishes the majority of its titles electronically, some exclusively in electronic format.

TRB books and reports span the range of transportation functions, disciplines, and modes. In 2017, TRB reorganized to consolidate and streamline the editing, production, design, and publication of many TRB reports, including its journal series, magazine, policy studies, and other titles.

Beginning in 2018, responsibility for production of the *Transportation Research Record: Journal of the Transportation Research Board* will move

¹ www.trb.org/abouttrb/minoritystudent.aspx

from the responsibility of the Executive Office to the Technical Activities Division. TRB also will shift responsibility from the Executive Office to the Cooperative Research Programs and the National Academies Press for production of other TRB publications.

The TRB Publications Office produces titles in the following series:

- *Transportation Research Record: Journal of the Transportation Research Board* gathers technical papers that have been accepted for publication through a rigorous peer review process refereed by TRB technical committees. In 2017, the Board published 69 volumes containing 879 papers grouped by subject. TRR Online, a subscription and pay-per-view service, includes all journal papers published since 1996, providing access to approximately 17,000 papers in the TRR series.² The service allows all visitors to identify papers of interest and to review the abstracts. Access to the full papers is available to TRR Online subscribers and to employees of TRB sponsors; papers also may be purchased individually. In 2017, approximately 180 papers accepted for publication without revision were edited, typeset, and posted to TRR Online between January 3 and March 31; the papers represented the first installments of 44 volumes. In addition, TRB assigned the digital object identifiers, or DOIs—which locate a paper more reliably than a web address or a search by title or

² www.trb.org/Finance/TRRJournalOnline1.aspx



author—soon after submittal, allowing authors to cite papers in advance of publication. In October, TRB announced plans to publish the journal with the assistance of a commercial publisher, starting in 2018. This change is expected to accelerate the release of journal papers and to increase the citations rating, as well as to upgrade the journal in accordance with industry standards.

■ The bimonthly magazine, *TR News*, features timely articles on innovative and state-of-the-art research and practice in all modes of transportation. The Research Pays Off series, news items of interest to the transportation community, profiles of transportation professionals, book summaries, and highlights of TRB activities also are included. In 2017, *TR News* published theme issues on transportation and the economy, moving research into practice, and transportation systems resilience. Selected features are posted on the TRB website, and the full issue is made accessible on the web on a four-month delay.³

■ *Special Reports* contain the results of TRB policy studies on issues of national importance in transportation. These studies—many conducted at the request of federal agencies or of the U.S. Congress—focus on a variety of complex, often controversial, topics. Special reports published in 2017 included the print and final online versions of *In-Service Performance Evaluation of Guardrail End Treatments*; *Designing Safety Regulations for High-Hazard Industries*; and *Safely Transporting Hazardous Liquids and Gases in a Changing U.S. Energy Landscape*. All current and selected out-of-print special reports are posted on the Board's website.⁴

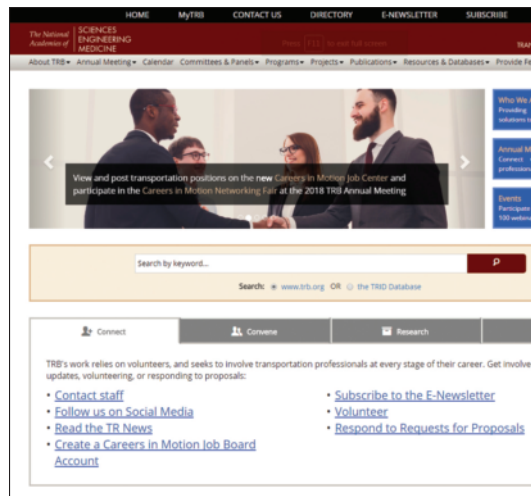
■ *Conference Proceedings* and *Conference Proceedings on the Web* assemble formal papers, presentations, and summaries of discussions from TRB conferences and workshops. For example, the 10th University Transportation Spotlight Conference focused on research related to pedestrian and bicyclist safety. This report was one of TRB's Conference Proceedings on the Web series.⁵

■ *Transportation Research E-Circulars* cover a wide range of formats and can include research problem statements, reports from TRB-sponsored workshops, and documents by TRB Technical Activities committees that detail the state

³ www.trb.org/Publications/PubsTRNewsMagazine.aspx

⁴ www.trb.org/Publications/PubsPolicyStudiesSpecialReports.aspx

⁵ www.trb.org/Publications/PubsConferencesandWorkshopsWeb.aspx



The TRB home page was revamped in 2017.

of the practice in a particular field. Titles this year covered such topics as freight data, automated vehicles, global efforts to reduce deaths and serious injuries associated with run-off-road crashes, advancing multimodal mobility, and enhancing freeway operations. E-Circulars are available exclusively in electronic format on the TRB website.⁶

In addition, the Cooperative Research Programs produced an array of titles in several publications series. For a list of all TRB publications, see pages 54–56.

Communications

TRB has undertaken a variety of initiatives to improve the communication and public awareness of transportation issues and to enhance the dissemination of research findings worldwide.

Communications milestones for 2017 included the following:

- Refreshing the look of the TRB home page and report web pages and providing a mobile-responsive interface for readers;
- Reaching 70,000 subscribers to the NASEM TRB E-Newsletter;⁷
- Increasing engagement and growth on Twitter, with 19,000 followers; Facebook, with 6,800 likes, and LinkedIn, with 3,900 followers;⁸
- Attracting an average of 415,000 visits per month to TRB's website, www.TRB.org;
- Production of nearly 100 webinars attended by

⁶ www.trb.org/Publications/PubsTransportationResearchCirculars.aspx

⁷ www.trb.org/Publications/PubsTRBENewsletter.aspx

⁸ www.trb.org/ElectronicSessions/Twitter.aspx



Jana Sorchor (*center*), Chalmers University of Technology, Sweden, confers with Cassie Halls (*right*), Shared-Use Mobility Center. Increasing accessibility to a diverse range of stakeholders is a goal of several TRB initiatives. (Photo: Risdon Photography)

- a total of more than 35,000 people;⁹ and
- Creation of 15 TRB Straight to Recordings—on-demand webinars—that collectively had more than 4,100 views.¹⁰

Expanding the Stakeholder Community

The advent of new technologies, shared mobility services, and other factors are transforming the roles of traditional transportation organizations and leading to the creation of new ones. As TRB’s reach continues to grow, the Board works to become more diverse in its partnerships, more inclusive of new stakeholders, and more global in its reach. TRB launched several new initiatives in 2017 to better serve the changing needs of traditional stakeholders and to accommodate new stakeholders.

GLOBAL AFFILIATES PROGRAM

In 2017, TRB replaced its long-standing organizational affiliates package with a completely revamped Global Affiliates Program. In the new program, organizations can select a package of benefits commensurate with their level of desired support and the benefits they value most. Six levels of organizational support now are offered. Organizations can choose from more than 20 benefits, from those that provide knowledge and resources to those that offer participation, networking, and exposure.

⁹ www.trb.org/ElectronicSessions/ConferenceRecordings.aspx
¹⁰ www.trb.org/electronicsessions/str.aspx

FORUM ON PREPARING FOR AUTOMATED VEHICLES AND SHARED MOBILITY

During 2017, TRB launched its first National Academies–TRB Forum. A forum—also known as a roundtable—convenes representatives of government, industry, academia, and professional organizations on an ongoing basis to identify and discuss issues of mutual concern.

The Forum on Preparing for Automated Vehicles and Shared Mobility brings together organizational partners to share perspectives on the critical issues surrounding the deployment of automated vehicles and shared mobility. A key emphasis is on the discussion, identification, and facilitation of fact-based research needed to deploy these technologies in a manner and time frame that informs policy to best meet long-term goals. These goals include increasing safety, reducing congestion, enhancing accessibility, increasing environmental and energy sustainability, and encouraging economic development and equity. The forum is supported by more than 20 sponsoring and participating organizations. Other forum participants include representatives from key TRB and National Academies committees, as well as sister organizations.

CAREERS IN MOTION INITIATIVE

TRB’s new Careers in Motion initiative was launched in 2017 to support diverse and inclusive involvement as a core value for TRB staff, volunteers, contract awardees, projects, and transportation communities served by the Board. The initiative includes a networking fair at the 2018



The Arma driverless minibus in London. Fact-based research for the effective deployment of automated vehicle technology is the focus of the National Academies–TRB Forum on Automated Vehicles and Shared Mobility. (Photo: Julian Walker, Flickr)

TRB Annual Meeting, which will provide an opportunity for prospective employers from a range of sectors and modes to meet with transportation professionals interested in working for their organizations. The Careers in Motion initiative also includes an online job board.

GIVING PROGRAM

In 2017, TRB expanded opportunities for individuals and organizations who desire to support TRB through philanthropic contributions. These contributions help to

- Provide fellowships for young people and other targeted groups to travel to participate in TRB meetings and activities;
- Address new and emerging transportation issues;
- Self-initiate TRB policy studies;
- Establish special programs, such as a Leadership Development Program in Transportation Research; and
- Fund the National Academies' Mirzayan Fellows program or other fellowships for short-term internships at TRB.

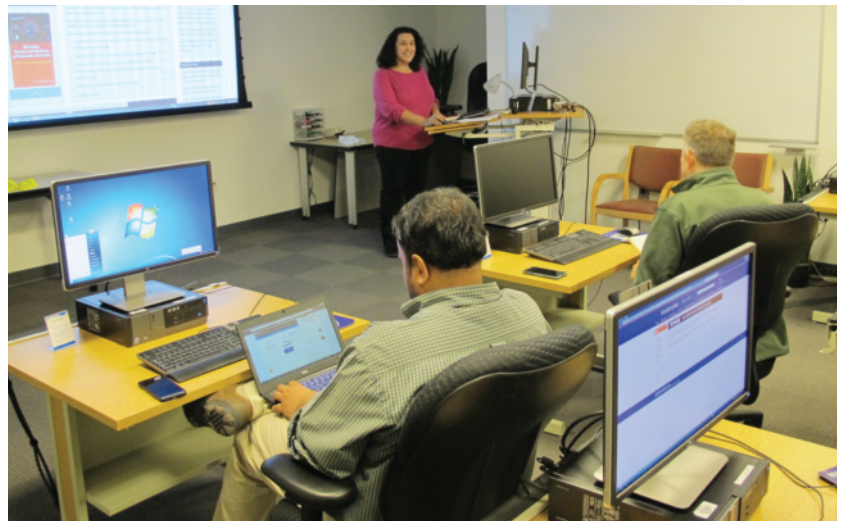
Additional information can be found by clicking on the "Support" button on the TRB home page (www.TRB.org).

Information Technology and Research Services

The responsibilities of the Information Technology (IT) and Research Services group include customer support for internal and external users of TRB's software systems; software enhancement and development; server and website monitoring and security; general IT support activities, such as training, documentation, and troubleshooting; producing and managing Transportation Research Information Services (TRIS) databases; and managing the TRB Library.

INFORMATION TECHNOLOGY

TRB relies on several software systems to meet program requirements: to maintain committee records, build and maintain TRB's extensive website, build and make available the TRIS bibliographic databases, support the Annual Meeting paper submittal and peer review process, and help manage and monitor the progress of Cooperative Research Programs projects and products.



Senior librarian Alexandra Briseno conducts a training session on evaluating the impact of TRB reports.

In 2017, TRB continued to develop and enhance the MyTRB site, incorporating feedback from internal and external users. MyTRB is a portal that provides technical standing committee leaders with a suite of online tools to manage committee membership, allows Annual Meeting participants to manage paper reviews and session development, and helps publications subscribers to manage claims for publications not received. MyTRB also allows committee members and other volunteers to maintain their own user profiles and contact information. The most recent enhancements include an integrated webinar registration through MyTRB and new features for TRB state representatives. Additionally, TRB IT staff and the Communications Office, in a joint effort, rolled out the new, responsive TRB.org home page.

TRANSPORTATION RESEARCH INFORMATION SERVICES

TRIS continues to develop and maintain the TRIS databases and in 2017 rolled out updated, responsive interfaces for the databases.

- **TRID** is a comprehensive bibliographic database containing more than 1.1 million records of citations and abstracts of transportation research in all modes and disciplines.¹¹ The records comprise published or ongoing research in English, German, French, or Spanish; more than 226,000 records link to full-text publications. All the TRIS

¹¹ <http://trid.trb.org>

databases are available free of charge on TRB's website.

- The **Publications Index** includes 73,000 citations and abstracts for all TRB, Highway Research Board (HRB), Strategic Highway Research Program (SHRP), and Marine Board publications since 1923.¹² Records contain links to available full-text documents and to ordering information.

- The **Research Needs Statements** database is a dynamic collection of highest-priority topics developed by TRB technical standing committees.¹³ The database serves as a tool for reviewing research needs, setting research priorities, and identifying gaps in current research. Approximately 1,300 statements are posted.

- **Research in Progress** (RiP) is a database of more than 14,400 records of active or recently completed research projects.¹⁴ The current awareness service notifies users about new and updated project records in specified subject areas. TRID offers users an option for searching the RiP database or the RiP and TRID databases simultaneously.

- The **Practice-Ready Papers** database of some 3,600 records helps practitioners easily find TRB Annual Meeting and journal papers identified by

peer reviewers as presenting research results immediately applicable to problems or issues.¹⁵ The database links to the full text of papers since 2006 and to abstracts from 1998 to 2005.

TRB LIBRARY

The TRB Library provides research and reference services to TRB sponsors, committee members, and staff. The library subscribes to more than 400 serial titles and contains the complete collection of TRB, HRB, SHRP, and Marine Board publications. The library participates in the Eastern Transportation Knowledge Network and in the National Transportation Knowledge Network.

Staff News

Patrice Davenport was hired as Deputy Director, Program Development and Strategic Initiatives.

Javy Awan, Director, Publications, and Editor, *TR News*; and **Juanita Green**, Production Manager, Publications Office, each announced their retirements after 18 and 19 years at TRB, respectively.

Joseph Heidenreich was hired by the IT and Research Services department as Senior Programmer-Analyst.

Alexandra Briseno joined TRIS as Senior Librarian.

¹² <http://pubsindex.trb.org>

¹³ <http://rns.trb.org>

¹⁴ <http://rip.trb.org>

¹⁵ www.trb.org/Publications/PubsPracticeReadyPapers/Background.aspx

ADMINISTRATION AND FINANCE



THE TRB ADMINISTRATION and Finance Division provides financial management services and administrative support for the work of TRB staff; financial oversight of the contracts and grants related to TRB activities; expenditure controls; administration of publications sales and distribution; maintenance of the benefits and services for sponsor and affiliate organizations; and liaison to the administrative and financial offices of the National Academies of Sciences, Engineering, and Medicine.

Financial Management

The division manages the contracts and grants that support TRB's work, prepares budgets for

continuing operations and individual projects, and controls expenditures. TRB's total expenditures are estimated at \$88 million for the calendar year 2017. A statement of income and expenditures appears on pages 10–11.

Affiliate and Sponsor Services

TRB's core programs have four main levels of support: student affiliates, individual affiliates, global affiliates, and sponsors. All affiliates and sponsors contribute to the support of TRB activities through annual contributions based on the level of services selected.

Individual and student affiliates' benefits include reduced registration fees for the TRB Annual Meeting; a complimentary subscription to *TR News*, TRB's magazine, which features articles on innovative and state-of-the-art research and practice in all modes of transportation; discounts on most TRB books and reports; and use of the TRB library.

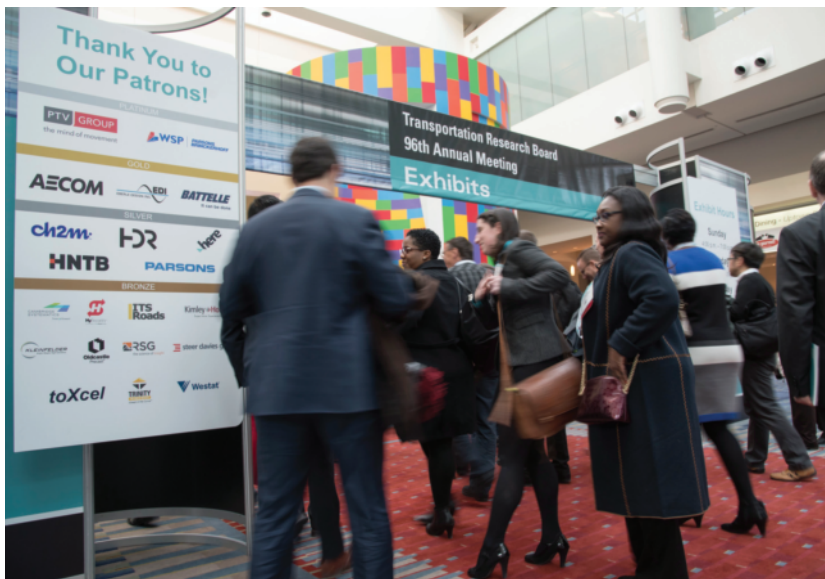
In 2017, TRB launched its global affiliates program, which replaced the organizational affiliates program and offers a new TRB designation for organizations that seek to shape the way the world travels, ships goods, and connects. Global affiliate organizations receive a wide range of benefits, including copies of TRB printed publications; agencywide access to TRR Online, the web posting of papers from the *Transportation Research Record: Journal of the Transportation Research Board*; and complimentary registrations—as well as marketing and exhibit oppor-



Gary J. Walker
Director
Finance and Business
Operations



Benefits for TRB affiliates include reduced or complimentary registration fees for the TRB Annual Meeting. (Photo: Risdon Photography)



Patrons help support the TRB Annual Meeting; sponsors provide a major source of funding for TRB's core activities. (Photo: Risdon Photography)

tunities—at the TRB Annual Meeting. The global affiliates program allows organizations to choose a level that best matches their specific interests and needs—from the Copper Contributor level, at \$5,000 annually, to the Inconel Icon level, at \$75,000 annually.

Organizations that are members of the Global Affiliates Sustaining Circle are entitled to complimentary registration for all employees to TRB webinars. In 2017, TRB conducted approximately 100 webinars on a variety of topics, with a total of more than 30,000 registrants. The webinars offered more than 100 professional development hours for professional engineers, and certified planners had the opportunity to earn more than 50 hours of certification maintenance credits from the webinars approved by the American Institute of Certified Planners. The minimum annual contribution to become a member of the Global Affiliates Sustaining Circle is \$25,000,

with a 20 percent discount for nonprofit organizations and educational institutions.

Sponsors are the major source of financial support for TRB's core programs. Federal, state, and local government agencies and professional societies and organizations that represent industry groups are eligible to participate as TRB sponsors. Fees and services are negotiated to fit each sponsor's needs and to assure fundamental support for the Board's programs and activities of interest to the entire transportation community. Each sponsor places a representative on the TRB Executive Committee. The current minimum annual contribution to become a TRB sponsor is \$70,000. (See pages 49–50 for a list of TRB sponsors and members of the Global Affiliates Sustaining Circle.)

Publication Sales and Distribution

TRB disseminates the results of transportation research and technology worldwide through the timely distribution of its publications. In addition to printed editions, TRB publishes almost all publications—some exclusively—in electronic format. The *Transportation Research Record: Journal of the Transportation Research Board* ceased producing a print edition after the 2016 series and is now available only in electronic format.

Sponsors, global affiliates, and subscribers have the option to receive all publications released by TRB or to receive only those publications in a particular transportation mode or select area of interest. A complete listing of TRB publications issued from January 1 through December 31, 2017, appears on pages 54–56.

Staff News

Doris M. Romero joined the staff as Financial Officer.

INSTITUTIONAL AFFILIATES

Sponsors

State Transportation Departments (Listed with TRB Representatives)

Alabama Department of Transportation
Juanita Owens

Alaska Department of Transportation and Public Facilities
Carolyn Morehouse

Arizona Department of Transportation
Dianne Kresich

Arkansas State Highway and Transportation Department
Elisha C. Wright-Kehner

California Department of Transportation
Jim Appleton

Colorado Department of Transportation
Amanullah Mommand

Connecticut Department of Transportation
Michael Connors

Delaware Department of Transportation
Drew Boyce

District Department of Transportation
Stephanie Dock

Florida Department of Transportation
James D. Dockstader

Georgia Department of Transportation
David Jared

Hawaii Department of Transportation
Casey C. Abe

Idaho Transportation Department
Ned E. Parrish

Illinois Department of Transportation
Megan Swanson

Indiana Department of Transportation
Barry K. Partridge

Iowa Department of Transportation
Peggi S. Knight

Kansas Department of Transportation
Richard Kreider

Kentucky Transportation Cabinet
Jason Siwula

Louisiana Department of Transportation and Development
Samuel Cooper

Maine Department of Transportation
Dale Peabody

Maryland State Highway Administration
Allison R. Hardt
Richard Y. Woo

Massachusetts Department of Transportation
Stephen Woelfel

Michigan Department of Transportation
Steven C. Bower

Minnesota Department of Transportation
Linda Taylor
Hafiz Munir

Mississippi Department of Transportation
Cynthia Smith

Missouri Department of Transportation
William Stone

Montana Department of Transportation
Susan C. Sillick

Nebraska Department of Roads
Mick S. Syslo

Nevada Department of Transportation
Ken Chambers

New Hampshire Department of Transportation
Ann Scholz

New Jersey Department of Transportation
Amanda Gendek

New Mexico Department of Transportation
Randall Soderquist

New York State Department of Transportation
Donald Streeter

North Carolina Department of Transportation
Neil Mastin

North Dakota Department of Transportation
Matthew Linneman

Ohio Department of Transportation
Cynthia L. Jones

Oklahoma Department of Transportation
David Ooten

Oregon Department of Transportation
Michael Edward Bufalino

Pennsylvania Department of Transportation
Jon Ulring

Rhode Island Department of Transportation
Colin A. Franco

South Carolina Department of Transportation
Terry Swygert

South Dakota Department of Transportation
David L. Huft

Tennessee Department of Transportation
Tanisha Hall

Texas Department of Transportation
Rocio Perez

Utah Department of Transportation
Cameron T. Kergaye

Vermont Agency of Transportation
Emily Parkany

Virginia Department of Transportation
Catherine McGhee

Washington State Department of Transportation
Rhonda Brooks

West Virginia Department of Transportation
Michael Pumphrey

Wisconsin Department of Transportation
Diane Gurtner

Wyoming Department of Transportation
Timothy McDowell

Federal Government

U.S. Department of Transportation
Federal Aviation Administration
Federal Highway Administration
Federal Motor Carrier Safety Administration
Federal Railroad Administration
Federal Transit Administration
National Highway Traffic Safety Administration
**Office of the Assistant Secretary of Transportation for
Research and Technology**

U.S. Air Force Civil Engineer Center
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Department of Energy
U.S. Department of the Interior
U.S. Environmental Protection Agency

Other Organizations

**American Association of State Highway and Transportation
Officials**
American Public Transportation Association
Association of American Railroads
California Air Resource Board

Marine Board Sponsors

Bureau of Safety and Environmental Enforcement
National Oceanic and Atmospheric Administration
Office of Naval Research
Office of the Supervisor of Salvage and Diving, U.S. Navy
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Maritime Administration

Global Affiliates Sustaining Circle

American Transportation Research Institute
Applied Research Associates, Inc.
Bentley Systems, Inc.
Caliper Corporation
Cambridge Systematics, Inc.
CH2M
Econolite
HDR
HNTB Corporation
National Transportation Safety Board
Ontario Ministry of Transportation
Port Authority of New York and New Jersey
Texas A&M Transportation Institute
U.S. Department of Agriculture
U.S. Forest Service
VHB
WSP

Calendar and Fiscal Year 2017 Financial Support Provided by

91 Sponsors and Sustaining Global Affiliates
78 Organizational Affiliates from 14 nations
More than 1,300 Individual Affiliates

TRB WEBINARS, WEBCASTS, AND STRAIGHT-TO-RECORDING SESSIONS

January 1, 2017–December 31, 2017

January

- 23 Roller-Compacted Concrete Pavements
- 30 Introduction of the New Culvert and Storm Drain Inspection Manual

February

- 8 Human Factor Issues with Roundabouts: The Need for Better Guidance
- 9 Safety Management System Approach for Wildlife Hazard Management at Airports
- 13 U.S. Department of Transportation's (DOT's) Smart City Challenge and Federal Transit Administration's (FTA's) Mobility on Demand Sandbox: Advancing Multimodal Mobility and Practices
- 15 The Economic Costs of Unreliability in Freight and Truck Travel Time
- 16 Internal Curing of Concrete Pavements
- 21 Effective Practices for the Protection of Highway Transportation Infrastructure from Cyber Incidents
- 22 Springtime Damage to Roads and Seasonal Load Limits
- 23 Emergency Ventilation for Smoke Control in Roadway Tunnels
- 27 Strategic Information Management for State Departments of Transportation
- 28 Legal Research for Airport Programs: Security Screening

March

- 9 Permeable Concrete Pavements
- 14 Winter Operations: Understanding Aircraft Deicers and Their Impact on Stormwater Runoff
- 16 Livable Transit Corridors
- 20 Advances in Concrete Pavement Joint Durability
- 21 Mini-Roundabouts: Is the United States Ready to Take Advantage of Their Benefits?
- 22 Guidelines for Lighting Overhead Signs

- 23 Advancing Collaborative Decision Making at Airports
- 28 Highway Rumble Strips: Approaches to Balancing Public Safety and Community Noise
- 29 Performance-Based Design and Improving the Geometric Design Process
- 30 Performance Specifications for Asphalt Mixtures

April

- 6 The Evolving Surface Transportation Maintenance and Operations Workforce, Part II: Developing a More Versatile Workforce Through Enhanced Training and Technology
- 10 Introducing the Guidelines for Implementing Managed Lanes
- 12 Practical Technology-Based Approaches to Highway Infrastructure Maintenance
- 13 Fundamentals of Resilient and Sustainable Buried Structures
- 17 Bases-Subbases for Concrete Pavements
- 19 Reconstructing Old Traffic Circles into Modern Roundabouts
- 20 Comparing the Volumetric and Mechanical Properties of Laboratory and Field Specimens of Asphalt Concrete
- 24 Planning and Growing Intercity Passenger Rail Programs at the State and Regional Levels
- 25 Reducing the Impact of Lead Emissions at Airports
- 26 Civil Integrated Management: Moving Forward with Implementation
- 27 Texture Measurements and Their Correlation with Pavement Functional Performance

May

- 3 A Look at the Legal Environment for Driverless Vehicles
- 10 Prioritizing Accessibility in Major Cities

- 11 Planning for Millennials: What Do They Want and How Do Agencies Prepare?
- 16 Incorporating Oversize-Overweight Data into Transportation Planning
- 17 Lessons Learned from the International Roughness Index Smoothness Specifications
- 18 Environmentally Sensitive Stream Bank Protection
- 22 NextGen for Airports: Introduction and Overview
- 24 NextGen for Airports: Resources and Guidebooks
- 30 Planning and Preliminary Engineering Applications Guide to the *Highway Capacity Manual*: Part 1, Contents
- 31 High-Tension Cable Barriers: Lessons Learned

June

- 7 Innovative Financing for Public Transportation: Value Capture and Small- and Medium-Sized Public-Private Partnerships
- 8 Use of Traffic-Speed Deflection Devices in Network-Level Pavement Management Applications
- 12 Information Technology Systems at Airports
- 15 Assessing, Coding, and Marking of Highway Structures in Emergency Situations
- 20 Business Continuity Planning for Disruptions at Airports
- 22 Direct Displacement-Based Seismic Design of Bridges
- 28 Planning and Preliminary Engineering Applications Guide to the *Highway Capacity Manual*: Part 2, Applications

July

- 17 Pavement Management Practices in the United States and Canada
- 20 Application of Intelligent Compaction Technology for Compaction Quality Control of Pavement Layers

- 25 Integrated Approach to Managing Regulatory Compliance
- 26 Accessibility Guidance for Roundabouts and Channelized Turn Lanes
- 27 Guidelines for Geofoam Applications in Slope Stability Projects
- 31 Flexible Pavement Rehabilitation: Looking Back, Looking Forward

August

- 10 Financially Responsible Procurement Processes for Airports
- 15 Innovative Statewide Partnerships for Active Transportation Planning
- 16 National Institute for Standards and Technology Approach to Resilience in Transportation
- 17 Control of Concrete Cracking in Bridges
- 21 New Pavement Engineering Technologies: Long-Term Pavement Performance Climate and Bind Tools
- 22 Geometric Highway Design Process for the 21st Century
- 23 Development of Crash Modification Factors for Pedestrian Crossing Treatments
- 24 Learning About and Using the Research in Progress Database

September

- 5 Rigid Pavement Rehabilitation: Looking Back, Looking Forward
- 6 Understanding Changes in Youth Mobility
- 7 Benefit-Cost Methodologies for Evaluating Multimodal Freight Corridor Investments
- 12 Use and Potential Impacts of Aqueous Film-Forming Foams at Airports

- 14 Understanding Stormwater Management Requirements for Airports
- 14 National Transit Institute: Onboard Camera Applications for Buses*
- 18 Modern Roundabouts: Downtown and Suburban Revitalization
- 19 Planning and Managing Park and Ride
- 20 Watershed Approach to Mitigating Stormwater Impacts
- 25 Designing and Producing High Reclaimed Asphalt Pavement and Recycled Asphalt Singles Mixtures
- 26 Commodity Flow Survey Microdata to Estimate the Generation of Freight, Freight Trips, and Service Trips
- 27 Strategies for Integrating Goods and Services Movement in Smart-Growth Environments
- 28 Seismic Design of Bridge Abutments

October

- 2 Analyzing Crashes on Multilane Roundabouts
- 3 Solutions for Aging Low-Volume Road Bridges
- 10 Condition of Assessment of Bridge Posttensioning and Stay Cable Systems Using Nondestructive Evaluation Methods
- 11 Developing Pavement Performance Models
- 12 Part-Time Shoulder Use
- 17 Advancing the Aviation Industry Workforce
- 18 Don't Sit on Your Assets: Innovative Approaches to Raise Revenue
- 19 Methodology for Prioritizing Tunnel Improvement and Developing Capital Plans

- 23 Performance-Grade Specifications for Emulsions Used in Pavement Preservation Treatment
- 25 Long-Term Field Performance of Warm Mix Asphalt Pavements
- 31 Expediting the National Environmental Policy Act Process: What Does It Take?

November

- 2 Geotech Tools: Information and Technology Guidance for Embankment, Ground Improvement, and Pavement Applications
- 6 Optimizing the Risk and Cost of Materials Quality Assurance
- 7 Right-Sizing Roundabout Intersections for State Highways
- 8 Policy and Planning Actions to Address Connected and Automated Vehicles
- 9 Practical Techniques for Successfully Communicating Technical Topics
- 13 Design of Interchange Loop Ramps and Pavement-Shoulder Cross-Slope Breaks
- 14 Airport In-Terminal Concession Program Implementation
- 14 How to Survive and Thrive at the TRB Annual Meeting
- 16 Regulations and Policies Impacting Automated Vehicles-Connected Vehicles Introduction in Transit

December

- 6 Improving Asphalt Content Determination Through Ignition Testing

* TRB was cosponsor of the webinar.

TRB CONFERENCES AND WORKSHOPS

(January 1, 2017–December 31, 2017)

January

- 7 TransportationCamp D.C.
- 8–12 TRB 96th Annual Meeting

February

- 2–3 Planning for Shifting Trade Workshop*

March

- 12–15 Geotechnical Frontiers 2017 Conference*
- 20–23 10th International Conference on Managing Fatigue*
- 30 3rd Annual Contra Costa Redefining Mobility Summit

April

- 4–7 Joint Rail Conference*
- 10–12 International Congress on Transport Infrastructure and Systems*
- 25–27 11th International Bridge and Structures Management Conference

May

- 1 TRB Workshop at the 68th Highway Geologists Symposium*
- 4–5 2nd Annual Texas A&M Transportation Technology Conference
- 8–10 5th International Conference on Roundabouts
- 11–12 Ferry Safety and Technology Conference*
- 14–18 International Conference on Ecology and Transportation*
- 14–18 16th National Transportation Planning Applications Conference
- 17–18 Innovations in Freight Data Workshop
- 21–24 5th Urban Street Symposium*

June

- 4–6 1st World Transport Convention*
- 4–8 3rd North American Symposium on Landslides*
- 8–9 6th International Symposium on Naturalistic Driving Research
- 9–12 International Conference on Transportation Infrastructure and Materials*

10 Rail Safety Management Systems, Risk Reduction, and Improving Safety Culture: What Do You Need to Know?

12–15 1st International Roadside Safety Conference: Safer Roads, Saving Lives, Saving Money

12–16 World Conference on Pavement and Asset Management*

14–17 Workshop on Future *Highway Capacity Manual* Updates

28–30 10th International Conference on the Bearing Capacity of Roads, Railways, and Airfields*

July

6–7 3rd International Symposium on Transportation Soil Engineering in Cold Regions

11–13 Automated Vehicles Symposium*

15–19 GeoMEast International Conference: Innovative Infrastructure Geotechnology*

16–18 International Bridge, Tunnel, and Turnpike Association–TRB Joint Symposium on Managed Lanes and All-Electronic Tolling*

19–21 Maintenance and Rehabilitation of Constructed Infrastructure Facilities*

24–26 22nd International Symposium on Transportation and Traffic Theory*

27–28 8th International Visualization in Transportation Symposium: Visualization in Action

30–Aug. 2 56th Annual Workshop on Transportation Law

August

21–22 9th New York City Bridge Conference*

22–25 16th Biennial Asilomar Conference on Transportation and Energy*

27 American Society of Civil Engineers International Conference on Highway and Airfield Technology

September

6–8 Transit Geographic Information Systems Conference*

11–13 2nd Conference on Transportation Needs of National Parks and Public Lands:

Partnerships for Enhancing Stewardship and Mobility

26 Role of Advanced Technologies in Structural Engineering for More Resilient Communities

26–27 11th University Transportation Centers Spotlight Conference: Rebuilding and Retrofitting the Transportation Infrastructure

26–28 1st International Intelligent Construction Group Conference*

October

6 10th SHRP 2 Safety Data Symposium: From Analysis to Results

15–19 American Concrete Institute Fall Convention*

26–27 5th Community Resilience Panel Meeting

29–Nov. 2 Intelligent Transportation Systems World Congress*

November

6–9 6th International Human Factors Rail Conference*

8–9 Forum on the Impact of Vehicle Technologies and Automation on Users*

12–15 2nd Pan-American Conference on Unsaturated Soils*

14–15 5th Florida Automated Vehicles Summit*

14–16 Applying Census Data for Transportation

14–16 29th Road Profile Users Group Conference*

14–17 18th International Road Federation World Road Meeting*

16–17 5th Annual University Transportation Centers Conference for the Southeastern Region*

December

7–8 National Accelerated Bridge Construction Conference*

17–20 4th Conference of the Transportation Research Group of India*

* TRB was cosponsor of the meeting.

PUBLICATIONS

(January 1, 2017–December 31, 2017)

Transportation Research Records (online)

2603 Public-Sector Aviation: Graduate Research Award Papers, 2017
2604 Systems Resilience and Climate Change
2605 Socioeconomics, Sustainability, Health, and Human Factors
2606 Revenue, Finance, Pricing, and Economics
2607 Railroads, Volume 1
2608 Railroads, Volume 2
2609 Freight Systems, Volume 1
2610 Freight Systems, Volume 2
2611 Marine Transportation and International Trade
2612 Maintenance and Preservation
2613 Maintenance Services, Transportation Weather, and Winter Maintenance
2614 Research and Education
2615 Highway Capacity and Quality of Service
2616 Freeway Operations; Regional Systems Management and Operations; Managed Lanes
2617 Visibility and Work Zone Traffic Control
2618 Operational Effects of Geometrics and Access Management
2619 Traffic Signal Systems, Volume 1
2620 Traffic Signal Systems, Volume 2
2621 Intelligent Transportation Systems
2622 Traffic Flow Theory and Characteristics, Volume 1
2623 Traffic Flow Theory and Characteristics, Volume 2
2624 Traffic Control Devices
2625 Connected and Automated Vehicles
2626 Aviation
2627 Air Quality
2628 Environment and Energy
2629 Concrete Materials
2630 Construction
2631 Asphalt Materials and Mixtures, Volume 1
2632 Asphalt Materials and Mixtures, Volume 2
2633 Asphalt Materials and Mixtures, Volume 3
2634 Developing Countries
2635 Safety Management
2636 Highway Safety Performance
2637 Motorcycles, Trucks, Buses, and Roundabouts
2638 Highway Design
2639 Pavements, Volume 1
2640 Pavements, Volume 2
2641 Pavements, Volume 3
2642 Structures
2643 Data and Methods to Understand Travel
2644 Traffic Monitoring: Automobiles, Trucks, Bicycles, and Pedestrians
2645 Information Technology, Geospatial Information, and Advanced Computing
2646 Managing Performance and Assets; Freight Data and Visualization
2647 Public Transportation, Volume 1: Urban and Rural Bus Services
2648 Public Transportation, Volume 2: Passenger Rail and Terminals
2649 Public Transportation, Volume 3: Management, Performance, and Quality of Service
2650 Public Transportation, Volume 4: Paratransit, Accessibility, Mobility, and the Sharing Economy
2651 Public Transportation, Volume 5: Planning, Demand Management, and Parking
2652 Public Transportation, Volume 6: Marketing, Fare Policy and Transformative Data Trends
2653 Planning Applications

2654 Planning
2655 Geological, Geoenvironmental, and Geotechnical Engineering, Volume 1
2656 Geological, Geoenvironmental, and Geotechnical Engineering, Volume 2
2657 Geological, Geoenvironmental, and Geotechnical Engineering, Volume 3
2658 Intersections of Transportation and Telecommunications: Findings by the 2016 Chan Wui and Yunyin Rising Star Fellows
2659 Statistical Methods and Safety Data and Analysis
2660 Operator Education and Regulation; Safe Mobility for Older Persons; Traffic Law Enforcement; Occupant Protection; Alcohol and Drugs
2661 Pedestrians
2662 Bicycles
2663 Human Performance, User Information, and Simulation
2664 Travel Behavior and Values, Volume 1
2665 Travel Behavior and Values, Volume 2
2666 Travel Behavior and Values, Volume 3: Effects of Information and Communication Technology on Travel Choices
2667 Network Modeling
2668 Demand Forecasting, Volume 1
2669 Demand Forecasting, Volume 2
2670 Finance and Pricing
2671 Social Economic, Sustainability, and Human Factors in Transit

Special Reports¹

323 In-Service Performance Evaluation of Guardrail End Treatments
324 Designing Safety Regulations for High-Hazard Industries
325 Safely Transporting Hazardous Liquids and Gases in a Changing U.S. Energy Landscape

Conference Proceedings on the Web (online)

21 Pedestrian and Bicycle Safety: Summary of the 10th University Transportation Centers Spotlight Conference

Letter Reports (online)

Review of the Department of Transportation Plan for Analyzing and Testing Electronically Controlled Pneumatic Brakes Letter Report: Phase 1, February 17
Long-Term Pavement Performance and Long-Term Bridge Performance Committees Joint Letter Report, March 14
Transit Research Analysis Committee Letter Report, June 5
Acquisition and Operation of Polar Icebreakers: Fulfilling the Nation's Needs, July 11
Review of the Department of Transportation Testing and Analysis Results for Electronically Controlled Pneumatic Brakes Letter Report: Phase 2, September 29

Transportation Research E-Circulars (online)

219 The U.S. Department of Transportation's Smart City Challenge and the Federal Transit Administration's Mobility on Demand Sandbox: Advancing Multimodal Mobility and Best Practices Workshop
220 First International Roadside Safety Conference: Safer Roads, Saving Lives, Saving Money
221 SHRP 2 Safety Data Student Paper Competition, 2015–2016
222 Automated Vehicles Symposium 2016
223 Innovations in Freight Data

- 224 11th International Bridge Management and Structure Conference
- 225 Research Issues in Freight Transportation: Congestion and System Performance
- 226 Transportation Systems Resilience: Preparation, Recovery, and Adaptation

TR News

Nos. 307–312

Online Newsletters

TRB Transportation Research E-Newsletter

Miscellaneous Publications

Access Management: Manual and Application Guidelines—Linked

Airport Cooperative Research Program (ACRP) Research Reports²

- 72 Guidebook for Selecting Methods to Monitor Airport and Aircraft Deicing Materials, Second Edition
- 150 NextGen for Airports
 - Volume 5: Airport Planning and Development
- 166 Interpreting the Results of Airport Water Monitoring: A Guidebook
- 167 Guidebook for Developing Ramp Control Facilities
- 168 Runway Protection Zones (RPZs) Risk Assessment Tool Users' Guide
- 169 Clean Water Act Requirements for Airports
- 170 Guidebook for Preparing Public Notification Programs at Airports
- 171 Establishing a Coordinated Local Family Assistance Program for Airports
- 172 Guidebook for Considering Life-Cycle Costs in Airport Asset Procurement
- 173 Use and Potential Impacts of AFFF Containing PFASs at Airports
- 174 Green Stormwater Infrastructure
 - Volume 1: Primer
 - Volume 2: Guidebook
- 175 Improving Intelligibility of Airport Terminal Public Address Systems
- 176 Generating Revenue from Commercial Development On or Adjacent to Airports
- 177 Enhancing Airport Wayfinding for Aging Travelers and Persons with Disabilities
- 178 Guidance for Usage of Permeable Pavement at Airports
- 179 Dispersion Modeling Guidance for Airports Addressing Local Air Quality Health Concerns
- 180 Guidebook for Quantifying Airport Ground Access Vehicle Activity for Emissions Modeling
- 181 Assessing Community Annoyance of Helicopter Noise
- 182 Guidance for Planning, Design, and Operations of Airport Communications Centers

ACRP Syntheses of Airport Practice²

- 79 Funding Industrial Aviation
- 80 Estimating Truck Trip Generation for Airport Air Cargo Activity
- 81 Food and Beverage and Retail Operators: The Costs of Doing Business at Airports
- 82 Uses of Social Media to Inform Operational Response and Recovery During an Airport Emergency
- 83 Preparing Airports for Communicable Diseases on Arriving Flights
- 84 Transportation Network Companies: Challenges and Opportunities for Airport Operators
- 85 Alternative Fuels in Airport Fleets

ACRP Research Results Digests²

- 25 Graduate Research Award Program on Public-Sector Aviation Issues Update: 2008–2017
- 26 Synthesis of Information Related to Airport Practices

ACRP Legal Research Digests²

- 31 Preemption of Worker-Retention and Labor-Peace Agreements at Airports

- 32 Evolving Law on Airport Implications by Unmanned Aerial Systems
- 33 Overview of Airport Duties and Standards of Care in Airfield Accident Cases

ACRP Web-Only Documents (online)

- 30 Development of a NO_x Chemistry Module for EDMS/AEDT to Predict NO₂ Concentrations
- 31 Improving Stakeholder Engagement in Aircraft Accident Response Planning
- 32 Improving AEDT Noise Modeling of Mixed Ground Surfaces
- 34 Aircraft Noise Conditions Affecting Student Learning—Case Studies

ACRP WebResources (online)

- 1 Aligning Community Expectations with Airport Roles
- 2 Airport Passenger Terminal Design Library
- 3 Airport Stormwater Electronic Resource Library and Training Materials

National Cooperative Freight Research Program (NCFRP) Research Reports²

- 37 Using Commodity Flow Survey Microdata and Other Establishment Data to Estimate the Generation of Freight, Freight Trips, and Service Trips: Guidebook
- 38 Guide for Conducting Benefit-Cost Analyses of Multimodal, Multijurisdictional Freight Corridor Investments

National Cooperative Highway Research Program (NCHRP) Research Reports³

- 834 Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities: A Guidebook
- 836 Guidelines for Emergency Ventilation Smoke Control in Roadway Tunnels
- 837 Performance-Related Specifications for Emulsified Asphaltic Binders Used in Preservation Surface Treatments
- 838 Guidelines for Optimizing the Risk and Cost of Materials QA Programs
- 839 A Performance-Based Highway Geometric Design Process
- 840 A Watershed Approach to Mitigating Stormwater Impacts
- 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments
- 842 Mapping Heavy Vehicle Noise Source Heights for Highway Noise Analysis
- 843 Long-Term Field Performance of Warm Mix Asphalt Technologies
- 844 Guide for Integrating Goods and Services Movement by Commercial Vehicles in Smart Growth Environments
- 845 Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Agencies
- 846 Improving Findability and Relevance of Transportation Information
- 847 Variability of Ignition Furnace Correction Factors
- 848 Inspection Guidelines for Bridge Posttensioning and Stay Cable Systems Using NDE Methods
- 849 Strand Debonding for Pretensioned Girders
- 850 Applying Risk Analysis, Value Engineering, and Other Innovative Solutions for Project Delivery
- 851 Proposed AASHTO LRFD Bridge Design Specifications for Light Rail Transit Loads
- 852 Method Selection for Travel Forecasting: User Guide
- 853 Guidance for Design Hydrology for Stream Restoration and Channel Stability
- 854 Guide for Identifying, Classifying, Evaluating, and Mitigating Truck Freight Bottlenecks
- 856 Specifying and Measuring Asphalt Pavement Density to Ensure Pavement Performance
- 857 Performance-Related Specifications for Pavement Preservation Treatments
- 859 Consequences of Delayed Maintenance of Highway Assets
- 861 Best Practices in Rural Regional Mobility

- 862 Guide to Deploying Clean Truck Freight Strategies
- 863 Material Properties of Cold In-Place Recycled and Full-Depth Reclamation Asphalt Concrete
- 864 Seismic Evaluation of Bridge Columns with Energy Dissipating Mechanisms
 - Volume 1: Research Overview
 - Volume 2: Guidelines
- 867 Keeping What You Paid For—Retaining Essential Consultant-Developed Knowledge Within DOTs

NCHRP Syntheses of Highway Practice³

- 500 Control of Concrete Cracking in Bridges
- 501 Pavement Management Systems: Putting Data to Work
- 502 Practices for Establishing Contract Completion Dates for Highway Projects
- 503 Leveraging Technology for Transportation Agency Workforce Development and Training
- 504 Strategic Program Delivery Methods
- 505 Current Practices and Guidelines for the Reuse of Bridge Foundations
- 506 Effective Utility Coordination: Application of Research and Current Practices
- 507 Traffic Signal Preemption at Intersections Near Highway–Rail Grade Crossings
- 508 Data Management and Governance Practices
- 509 Highway Worker Safety
- 510 Resource Allocation of Available Funding to Programs of Work
- 511 Relationship Between Chemical Makeup of Binders and Engineering Performance
- 512 Use of Fiber-Reinforced Polymers in Highway Infrastructure
- 513 Evolving Debt Finance Practices for Surface Transportation
- 514 Statewide and Megaregional Travel Forecasting Models: Freight and Passenger

NCHRP Research Results Digest³

- 401 Continuing Project to Synthesize Information on Highway Problems

NCHRP Legal Research Digests³

- 73 Primer on Patentability and Use of Ideas Developed by Contractors Performing Work for State and Federal Transportation and Local Planning Agencies
- 74 Liability of State Departments of Transportation for Design Errors
- 75 Legal Requirements for State Transportation Agency Participation in Conservation Plans

NCHRP Briefing Document¹

Strategies to Advance Automated and Connected Vehicles

NCHRP Web-Only Documents (online)

- 222 Guidelines for the Application of Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Difficulties: Final Project Report
- 225 Appendices to NCHRP Research Report 842
- 226 Data Visualization Methods for Transportation Agencies
- 227 Design of Interchange Loop Ramps and Pavement–Shoulder Cross-Slope Breaks
- 229 Methods and Technologies for Pedestrian and Bicycle Volume Data Collection: Phase 2
- 231 Challenges to CV and AV Applications in Truck Freight Operations
- 232 Communications Worker Credentialing Requirements
- 233 Mainstreaming Transportation Hazards and Security Risk Management: CAPTA Update and Implementation
- 234 Developing a Method Selection Tool for Travel Forecasting
- 235 Quantifying the Influence of Geosynthetics on Pavement Performance
- 236 Incorporating Slab–Underlying Layer Interaction into the Concrete Pavement Analysis Procedures

- 238 Developing the Guide to Retaining Essential Consultant-Developed Knowledge Within DOTs
- 239 Impacts of Laws and Regulations on CV and AV Technology Introduction in Transit Operations

NCRRP Web-Only Document (online)

- 4 Inventory of State and Federal, Passenger, and Freight Rail Programs

Transit Cooperative Research Program (TCRP) Research Reports (online)

- 189 Manual to Improve Rail Transit Safety at Platform/Vehicle and Platform/Guideway Interfaces
- 191 Public Transportation Guidebook for Small- and Medium-Sized Public-Private Partnerships (P3s)
- 192 Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation: Guidebook on Planning and Managing Park-and-Ride

TCRP Syntheses of Transit Practice (online)

- 124 Planning and Design for Fire and Smoke Incidents in Underground Passenger Rail Systems
- 125 Multiagency Electronic Fare Payment Systems
- 126 Successful Practices and Training Initiatives to Reduce Accidents and Incidents at Transit Agencies
- 127 Addressing Difficult Customer Situations
- 128 Practices for Evaluating the Economic Impacts and Benefits of Transit
- 129 Managing Extreme Weather at Bus Stops

TCRP Legal Research Digests (online)

- 48 Legal Issues Concerning Transit Agency Use of Electronic Customer Data
- 49 Updated Guide to Buy America Requirements—2015 Supplement
- 50 Public Transit Emergency Preparedness Against Ebola and Other Infectious Diseases: Legal Issues
- 51 Technology Contracting for Transit Projects

TCRP Research Results Digest (online)

- 113 Synthesis of Information Related to Transit Practices

TCRP Web-Only Documents (online)

- 69 Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation: Research Report and Transit Agency Case Studies
- 70 Improving the Resiliency of Transit Systems Threatened by Natural Disasters
 - Volume 1: A Guide
 - Volume 2: Research Overview
 - Volume 3: Appendixes A & B to the Research Report

¹ Available in print and online.

² Entire series available in print and online.

³ Publications released since 2001 available in print and online.

Cover photographs (clockwise from upper left)

Alan Schein Photography/Getty
 Bruno Souchon/EyeEm
 sal73it/iStock
 Thierry Dosogne/Getty Images
 Bernard Van Berg/EyeEm
 ands456/iStock
 Yun Han Xu/EyeEm
 Richard Levine/Alamy Stock Photo
 Back cover: Pete Ark/Getty Images

Beth Schlenoff, Graphic Designer

TRB STAFF

As of November 2017

Executive Office

Executive Director, Neil J. Pedersen
Executive Assistant, Cynthia M. Baker
Director, TRB Human Resources, Claudette Louard-Clarke
Administrative Assistant, Frances E. Holland
Associate Executive Director, Russell W. Houston
Director, Development and Strategic Initiatives, Mark R. Norman
Deputy Director, Program Development and Strategic Initiatives, Patrice A. Davenport

COMMITTEE APPOINTMENTS AND REPORT REVIEW

Senior Report Review Officer, Karen S. Feby
Manager, Committee Appointments and Databases, Robert J. Summersgill
Report Review Associate, Adrienne C. Blackwell

COMMUNICATIONS AND DISTANCE LEARNING

Director, Communications-Media, Lisa Berardi Marflak
Distance Learning Program Coordinator, Elaine Ferrell
Distance Learning and Electronic Dissemination Coordinator, Steve Andreadis
Customer Service and Marketing Associate, Reginald Gillum

PUBLICATIONS OFFICE

Acting Director, Eileen P. Delaney
Publishing Projects Manager, Jennifer J. Weeks
Publishing Projects Associate, Phyllis D. Barber-Gray
Managing Editor, Ann E. Petty
Senior Editor-Journal Project Manager, Linda A. Dziobek
Senior Editor, Janet M. McNaughton
TR News Editor, Javy H. Awan
Editor, Lea M. Camarda
Senior Editorial Assistant-Proofreader, Jennifer G. Correro
Production Manager, Juanita L. Green

INFORMATION TECHNOLOGY AND RESEARCH SERVICES

Director, Lisa L. Loyó
TRB Software Engineer, Andrew T. Strassburg
Business Systems Analyst, Michael A. DeCarmine
Transportation Research Information Services Manager, William B. McLeod
Senior Librarian, Alexandra M. Briseno
Indexing Manager, Janet S. Daly
Senior Programmer-Analyst, Joseph Heidenreich
End User Support Specialist, Alan W. Rezaei
HelpDesk-Business Systems Associate, Gareth E. Driver
Database Librarian, Beth S. Saffer
Library Clerk, James W. Yates, Jr.

Technical Activities

Director, Ann M. Brach
Program Manager, SHRP 2 Naturalistic Driving Study (NDS) Data and Public Transportation, Stephen J. Andrie
Associate Director-Data, Information, and Performance Management, Thomas M. Palmerlee
Associate Director-Design, Stephen F. Maher
Associate Director-SHRP 2 NDS Data, David J. Plazak
Associate Director-Transportation Safety, Bernardo B. Kleiner

Senior Program Officers:

Aviation and Environment, Christine L. Gerencher
Legal Research, Robert J. Shea
Maintenance and Preservation, James W. Bryant
Marine Transportation and Intermodal Freight; Marine Board, Scott Brotemarkle
Materials and Construction, Nelson H. Gibson
Public Transportation, Claire E. Randall
Rail and Freight, Scott Babcock
Social, Economic, and Policy, William B. Anderson
Soils, Geology, and Foundations, Nancy M. Whiting
Traffic and Operations, Richard A. Cunard
Transportation Planning, Jennifer L. Weeks

Program Officer:

SHRP 2 NDS Data, Alyssa M. Hernandez
Administrative Coordinator, Rosa P. Allen

Associate Program Officers:

Elizabeth Angela Christian
Brittney N. Gick
Gary A. Jenkins
Joanice L. Johnson
Mary O. Kissi
Mai Q. Le
Freda R. Morgan
Web and Software Usability Specialist, Brie Schwartz

MEETINGS

Director, Meetings Department, Edward G. Leonardo
Deputy Director, Meetings Department, Bruce A. Millar
Senior Conference Manager, Megan E. Kaufmann
Conference Manager, Samantha Stock
Meetings Assistants:
Kate Debelack
Theodore R. Jamele

STUDIES AND SPECIAL PROGRAMS

Acting Director, Thomas R. Menzies
Scholar, Stephen R. Godwin
Senior Program Officers:
Beverly A. Huey
Mark S. Hutchins
Katherine A. Kortum
Joseph R. Morris
Monica A. Starnes
Program Officer, Micah Himmel
Administrative Assistant, Amelia B. Mathis
Program Associate, Claudia Sauls
Senior Program Assistants:
Michael T. Covington
Anusha H. Jayasinghe

Administration and Finance

Director, Finance and Business Operations, Gary J. Walker
Financial Officers:
Eduardo N. Cusicanqui
Melissa N. Pickett
Amy M. Przybocki
Doris M. Romero
Daniel R. B. Somerset
Financial Associates:
Anthony T. Bailey
Sophia T. Ramirez
Senior Financial Assistant, G. Raymond McDaniel

PUBLICATION SALES AND AFFILIATE SERVICES

Senior Membership Assistant, Kelvin R. Jordan
Supervisor, Customer Service, Cydni Wolfinger
Publications Sales Representatives:
Rhonda A. Levinowsky
Kenny Yang

Cooperative Research Programs

Director, Christopher J. Hedges
Manager, NCHRP, Lori L. Sundstrom
Manager, TCRP, Gwen Chisholm Smith
Manager, ACRP, Michael R. Salamone
Implementation Coordinator, Sid Mohan

Senior Program Officers:

Mark S. Bush
Camille Crichton-Sumners
Waseem Dekelbab
B. Ray Derr
Mariela Garcia-Colberg
Jo Allen Gause
Lawrence D. Goldstein
Marci A. Greenberger
Amir N. Hanna
Edward T. Harrigan
Ann M. Hartell
Inam Jawed
Andrew C. Lemer
Joseph D. Navarrete
Stephan A. Parker
William C. Rogers
Theresia H. Schatz
Dianne S. Schwager
Gail R. Staba

Program Officer, Velvet Basemera-Fitzpatrick
Administrative Coordinator, Joseph J. Snell
Administrative Associate, Cynthia E. Butler
Program Associate, Sheila A. Moore

Program Coordinators:

Deborah Irvin
Brittany Summerlin-Azeez

Senior Program Assistants:

Anthony P. Avery
Megan Chamberlain
Cheryl Keith
Thu M. Le
Daniel J. Magnolia
Hana Vagnerova
Demisha Williams

Program Assistant, Stephanie L. Campbell
Director of Publications, Eileen P. Delaney

Senior Editors:

Natalie L. Barnes
Ellen M. Chafee
Hilary M. Freer
Scott E. Hitchcock

Editors:

C. Doug English
Margaret B. Hagood
Sharon Lambertson
Sreyashi Roy
Heidi Willis

Senior Editorial Assistant, Kathleen Mion
Systems Analyst, Roy N. Mesler

Web Developer, Natassja Olsen Linzau

Program Consultants:

Thomas J. Helms
Tanya M. Zwahlen



The National Academies of
SCIENCES • ENGINEERING • MEDICINE

The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide.

www.national-academies.org