

# The 1986 International Roundtable

## ***TRB Fosters Communication and Exchange of Information Among Transportation Professionals Throughout the World***

ROBERT A. HUBBARD, WILLIAM F. JOHNSON,  
and K.B. JOHNS

The International Roundtable is a traditional feature of the first day of the Transportation Research Board's Annual Meeting. It not only serves as a forum for the presentation of technical reports, but also as a focal point for transportation professionals from outside the United States to meet each other and TRB staff and volunteers. Many U.S. transportation professionals also attend the Roundtable, including the members of TRB's Committee on International Activities.

The 1986 International Roundtable featured a program that focused on improving communication and information exchange among transportation professionals throughout the world. Leaders in the transportation field from various countries made presentations on their own nation's research needs and on activities of international interest. Robert A. Hubbard, chairman of the Committee on International Activities, opened the Roundtable by discussing the many opportunities for transporta-

Participants in the 1986 International Roundtable held during TRB's 65th Annual Meeting in Washington, D.C.



Robert A. Hubbard is president, Wilbur Smith & Associates, Inc. William F. Johnson is acting director, Research Planning and Coordination, Research and Development, Transport Canada. K. B. Johns is director, Technical Activities, TRB.



Above, Robert A. Hubbard, chairman of TRB's Committee on International Activities, presided at the International Roundtable.

Below, K. B. Johns, TRB staff representative on the Committee on International Activities, and committee member William F. Johnson (bottom).



tion professionals from outside the United States to become involved in TRB activities and suggested that the Roundtable is one such way to do so. Papers may also be offered for presentation at Annual Meeting sessions and subsequent publication in the *Transportation Research Record* series. And most important, those from outside this country may volunteer for membership in any one of TRB's 166 standing committees and task forces. It is recognized that on-site participation of such members may be constrained by the cost of travel; however, many significant contributions can be made through correspondence. Chairman Hubbard encouraged those who want to become involved in TRB activities to communicate that interest to TRB.

The 1986 International Roundtable was highly successful: 15 speakers from 11 countries participated, and attendance was the largest ever for this annual TRB event. Following is a summary of the presentations; topics ranged from general overviews of the transportation research needs of various countries to specific technical findings.

## France



Bernard Fauveau, Permanent International Association of Road Congresses, France

Bernard Fauveau, Secretary General of the Permanent International Association of Road Congresses (PIARC), who also represented his own organization, the Ponts et Chaussées in Paris, described PIARC, which was organized in 1908 to foster progress in the construction, improvement, maintenance, and use of roads. An organization of national governments, PIARC memberships include highway departments, universities, associations, automobile clubs, and individuals. Currently there are 53 government members, and an additional

Brussels International Conference Center: site of the 1987 PIARC World Road Congress, to be held in Belgium, September 13-19.





15 countries are represented by other classes of memberships.

Much of the technical work of PIARC is conducted by 12 technical committees that cover surface characteristics; testing of road materials; roads in developing regions; interurban roads; road tunnels; maintenance management; concrete roads; flexible roads; economics and finance; urban areas; road bridges; and earthworks, drainage, and subgrade. PIARC committees also plan and conduct conferences on selected subjects such as traffic, safety, and winter maintenance.

A world road congress is organized and conducted by PIARC every 4 years. The next congress will be held in Brussels on September 13–19, 1987, at which representatives from member nations will present reports in six technical areas: flexible roads, rigid pavements, drainage, interurban roads, roads in urban areas, and roads in developing regions. The technical committees will meet for open discussions on road safety, technology transfer, and road management systems. Nine other workshops on selected topical questions are also planned.

Fauveau concluded by requesting that the Roundtable attendees find ways to encourage TRB volunteers and staff to take part in PIARC activities. He also promised to work toward getting PIARC members more involved in the work of TRB. Chairman Hubbard endorsed these ideas for mutual cooperation and promised the support of his committee in effecting them.

## Great Britain

Geoff Margason, Director of the Transport and Road Research Laboratory (TRRL) in Great Britain, outlined a major group of studies in the public passenger transport field that concern passenger service deregulation, an issue of worldwide interest. Against a background of regulation of the U.K. bus industry dating to 1930, the intention of which was to improve safety and op-



Geoff Margason,  
Transport and Road  
Research  
Laboratory, Great  
Britain

erations in the public interest, Margason described the effects of regulation that constrained competition and led in some cases to monopoly operations. A declining bus industry, even in the face of expanding travel and demand, led to higher fares and higher subsidies that increased by a factor of 13—from £40 million in 1972 to £520 million in 1982.

Deregulation began in 1980 with limited freedom for certain types of service; by 1985 the policy had been broadly extended, leading to an expectation of a fully open, competitive situation later

in 1986. TRRL will monitor implementation of the 1985 Transport Act for the Department of Transport to (a) provide up-to-date facts on what is happening, and (b) develop an in-depth understanding of the impacts as they take place.

A three-level approach is being utilized for the research program for monitoring the Transport Act. This approach is designed to strike a balance among general studies of national trends and developments, more detailed studies of identified topics in representative areas of the country, and specific detailed ad hoc investigations of particular phenomena that may be localized or transient in nature. The program content includes fields of study that will be addressed at the three different levels of generality under the following headings: national studies, area studies, and case studies.

The national studies will be based mainly on national statistics from local authorities, police, and vehicle inspectors. The most important source of information will be a national index of registration of services that will be established under the Transport Act. To

TRRL will study the effects of the 1985 Transport Act, which broadly extended deregulation of bus service in Great Britain.  
(photograph from London Buses Ltd.)





be retained on the computer at TRRL as a national facility, the index will be a massive data bank on every bus service operating in Great Britain.

The aim of the local group of studies is to discover how authorities set about their new tasks and how well the new arrangements work in practice, as well as to determine the financial consequences. For example, the issues to be investigated include the following: How do the authorities decide which non-commercial services should be provided and how do they coordinate them with the commercial services that the market decides to provide? What is the total value of contracts awarded and how does that compare with the previous support revenues (£520 million)? How are standards of maintenance affected? What are the impacts of possible novel forms of public transport that may emerge?

Both quantitative and qualitative techniques will be used in the area studies to provide detailed information about changes, including data on levels of service, fares that are charged on the open market, effects on demand for public transport, role of local authorities in the new setting, and social consequences of the changes. The areas chosen for the studies represent a national spread, with England, Wales, and Scotland included, and a geographical distribution that takes into account climate and social differences and includes different types of major transport operators in the conurbations.

Finally, it is planned to set up case studies as the need arises. Possible case studies include situations in which keen competition among operators develops, traffic congestion is caused by competing bus services, and social consequences may occur because of withdrawal of services. The case studies will be planned in detail as opportunities arise; provision has been made for resources to be available on short notice for this work. During the transition period between February 1986 and the full force of the Act, which will come in October, it is expected that the national index of registration of services will provide data for advance planning for some of these studies.

## West Germany

Herbert Kuehn,  
Road and  
Transportation  
Research  
Association, West  
Germany



Herbert Kuehn, Executive Director of the Road and Transportation Research Association in West Germany, described his organization as a private association founded in 1924, operating in some respects similar to TRB. With the help of broad-based technical committees, the association proposes an annual research program to the Federal Ministry of Transportation in West Germany. The results of the association's research are available worldwide through TRB's Transportation Research Information Services—an excellent example of international cooperation.

Kuehn discussed a program begun in the mid-1960s that reflects the same motivations as the Strategic Highway Research Program's (SHRP) Long-Term Pavement Performance (LTPP) project. A total of 170 pavement sections were selected for study, compared with the 3,000 or more selected for the LTPP project. It was difficult to draw general conclusions in the study because of wide variation in conditions in the test sections. Generally, however, it was found that most pavements behave better than should be expected based on the design.

In recent years, several topics have dominated the West German highway research program. Considerable attention has been given to the environmental impacts of highways and traffic—how to quantify, predict, and evaluate these effects in the planning phase, and how to develop means of reducing these impacts to tolerable levels. Concern about improvement of the capacity of the existing roadway network is also evident.

As in many parts of the world, environmental and cost considerations preclude enlarging the network to meet increasing demand, leading to experimentation with high-tech microelectronic navigation systems. Another issue of concern, again common to many countries and to SHRP, is pavement management. Optimization of corrective measures for road surfaces, along with recycling and use of industrial by-products, has been given priority. Efforts are being made to improve quality assurance in road construction through reviews of testing methods and specifications as well as construction-integrated test methods.

Kuehn concluded by pointing to similarities of technical interest between his association and the Strategic Highway Research Program (SHRP) and between his association and TRB. He cautioned that the SHRP focus on asphalt, cement and concrete, and concrete bridge components should include the issue of statistical quality assurance.

## Sweden

Karl-Olav Hedman,  
Swedish National  
Road Administration



Complementary research programs in Sweden were described by two of the speakers. Karl-Olav Hedman of the Swedish National Road Administration discussed national passenger and freight systems that are heavily dependent on roads. Research priorities in Sweden are



## Spain

Hans Sandebring,  
Swedish Road and  
Traffic Research  
Institute



aimed at four areas: economics and socioeconomics; passenger transport needs as related to societal development, environmental concerns, and the special needs of the elderly and disabled; freight transport, present and future; and traffic safety. In these four areas, the tendency is to place increased emphasis on long-term basic research and development in a limited number of important fields.

Speaking about pavements, Hedman cited the importance of maintenance and the need for more efficient equipment to measure pavement condition. A special van has been developed in Sweden to measure road roughness and rut depth, and the measurement of deflections at roadway speeds is being considered. Cold winters and winter maintenance needs are major factors in the development of road condition monitoring systems and automatic weather stations to predict ice and snow.

Hedman's colleague, Hans Sandebring, Director General of the Swedish Road and Traffic Research Institute, outlined programs that not only complement those of the Swedish National Road Administration, but also extend to other government and private-sector groups. An interdisciplinary organization, the institute includes departments that concentrate on expertise and equipment related to the road user, the vehicle, and the road. Sandebring described current research in which actual drivers perform on a driving simulator in testing the effects of alcohol and other drugs on driving performance.

In a discussion of European railways, Manuel Diaz del Rio y Jaudenes focused primarily on the lower consumption of energy by rail compared with that of road transport. He pointed out that the railways are the most energy-efficient transport mode in the European community. For example, in 10 European countries energy consumption by rail in 1979 was significantly lower than that of all modes except pipelines for the two main transport sectors: passenger and freight (see Table 1).

Noting that transport in the European community accounts for nearly 20 percent of total energy consumption and 40 percent of overall oil consumption, Diaz del Rio stated that automobiles in urban traffic carrying 1.4 passengers consume 60 oil equivalent grams (oeg) per passenger-km versus 20 oeg for a suburban train with an average load factor of 18 percent. The major European urban centers are developing their transport systems on the basis of the implications of these data.

Today European railways can provide high-quality service (with respect to journey time, comfort, ease of access) over medium distances (up to approximately 600 km), which makes them highly capable of gaining passengers from airlines, or at least motivating some passengers not to drive further than the station car park. The energy savings is an added bonus. The French railways' TGV is a good example of a railway that is attracting passengers from other

Manuel Diaz del  
Rio y Jaudenes,  
Spain



transport modes. The trains travel at a speed of 260 km/h, use 16 oeg per passenger-km, and have a proven load factor of 65 percent.

After describing the energy consumption of the various transport modes, Diaz del Rio turned to the question of transportation's dependency on oil. He suggested that during the next 20 years air and road transport will remain completely dependent on oil. However, this will not be the case with railways as long as the trend toward electrification continues. In Europe the percentage of railway electrification is high—more than 80 percent in some regions—and is expected to increase in the future. See Table 2 for sources of energy in 1979 and predicted for 1990.

Concluding on this topic, Diaz del Rio stated that railways provide the same service and consume two to four times less energy than road transport. In addition, he foresees that through electrification, railways will move away from being dependent on oil.

**TABLE 1 1979 Rail Energy Consumption Versus Energy Consumption of Other Transport Modes in 10 EEC Countries**

Transport Sector	Mode	Market Share (%)	Final Energy Consumption (%)
Passenger (passenger-km)	Road	92	94.6
	Rail	8	5.4
Total		100	100.0
Freight (ton-km)	Road	56	76.6
	Inland waterways	12	9.6
	Pipelines	10	5.0
	Rail	22	8.8
Total		100	100.0

**TABLE 2 Sources of Energy, 1979 and 1990**

Energy Source	1979		1990 Forecast	
	TWh <sup>a</sup>	Percent	TWh <sup>a</sup>	Percent
Oil	306	24	268	14
Coal	566	45	735	38
Gas	162	13	130	7
Nuclear power	168	13	722	38
Hydroelectric power	63	5	63	3
Total	1,266	100	1,918	100

<sup>a</sup>Production is expressed in terawatt hours (TWh).

Finally, Diaz del Rio noted the differences in railroad track structures and geometry between European and American railroads. Because of the economic advantages of heavier freight loadings in the United States, the railroads have opted to reduce the cost of track maintenance by designing track structures to accommodate 100-ton cars and high-quality diesel engines and have avoided the use of high-speed conventional passenger trains. The European railroads, with lighter freight loadings and less resistant and sophisticated rapid diesel engines, have adopted electric traction with twice the adhesion of traditional diesel locomotives. Thus European tracks can be more firmly secured and can be operated at lower maintenance costs.

## Denmark

Ivar Schacke,  
National Road  
Laboratory,  
Denmark



Ivar Schacke of the National Road Laboratory in Denmark described a paved road system in Denmark that consists of 43,000 miles. Approximately \$4 million is being spent annually on research for this system in a program begun in

1928. This organization for research assures interaction between researchers and users. A common road data bank for all main and county roads has been in use since 1978, and the National Road Laboratory plays a strong role in the development of standards for roads.

Schacke also described trends in application of the concepts of services to road users; consideration of socioeconomic factors in road design, construction, rehabilitation, and maintenance; implementation of new ideas in traffic management; and introduction of new, high technology to highways. Approximately 80 percent of current research resources is now devoted to five major areas: (a) pavement maintenance (all second-generation investments), (b) surface distress (going beyond visual inspection to objective measurements), (c) environment and safety, (d) materials, and (e) traffic management.

Per Ullidtz of the Technical University of Denmark indicated that Denmark accepted the analytical and empirical methods of pavement design in the early 1960s. Both aspects have known shortcomings that have been under investigation for many years. A full-scale road testing machine has been built to measure stresses, strains, and deflections for comparison with those predicted. Denmark was one of the nine countries participating in the Organisation for Economic Cooperation and Development (OECD) Nardo, Italy, test pavement, which was instrumented with more than 200 strain gauges of different types. Tests with falling weights enabled comparisons between calculated and measured stresses and strains. This program is an excellent example of in-

Per Ullidtz,  
Technical University  
of Denmark



ternational cooperation in areas of common concern.

Ullidtz observed that the methods for predicting pavement performance can only be improved through a fundamental understanding of pavement response, and that both the OECD full-scale tests and the in-service pavement studies in SHRP will significantly aid in achieving this goal.

## South Africa

S.H. Kühn,  
National Institute  
for Transport and  
Road Research,  
South Africa



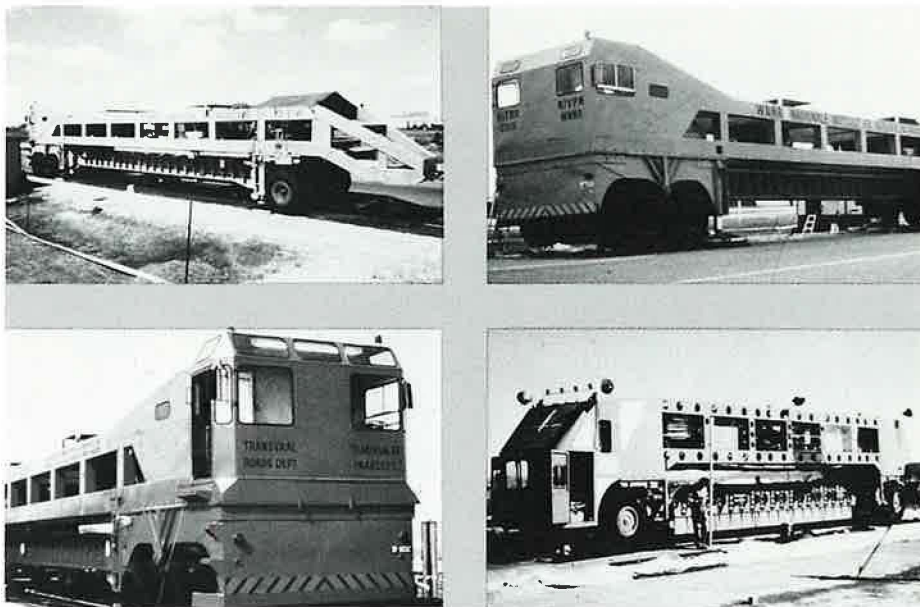
Steve Kühn of the National Institute for Transport and Road Research in South Africa described two instruments that have been used successfully to assess damage to roads. The first is the heavy vehicle simulator (HVS), which was built in 1970. Later models, each costing about \$270,000, were put into use in 1977. Currently costing an estimated \$700,000, an HVS costs an additional \$500,000 annually to operate. Capable of simulating 20 years of heavy loads in 2 to 3 months, the HVS machines have led to reductions of pavement thicknesses, use of previously substandard materials, im-



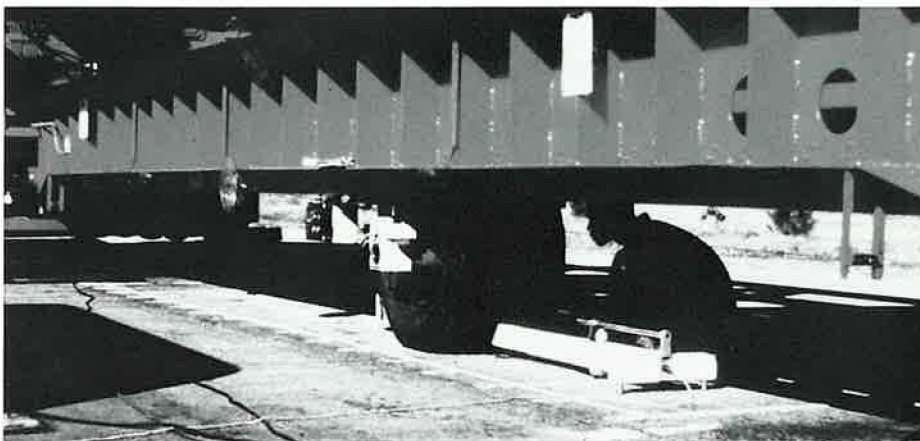
proved designs, better understanding of pavement and materials behavior, and rapid evaluation of new rehabilitation techniques. The monetary benefits realized from the instrument are conservatively estimated at \$15 million annually. With the use of an HVS, either a single or a dual wheel load can be applied over a 10-meter length of pavement at about 14 km/h. Because the load can be varied from 20 to 100 kilonewtons for roads, overloading tests can be carried out. For airfield tests, a single aircraft wheel can be loaded up to 200 kilonewtons, the full load of a Boeing 747 wheel.

The second instrument described by Kühn is the traffic data logger (TDL). Fully portable, the TDL logs comprehensive data without slowing or stopping traffic, and can record data simultaneously from two lanes by using sensors taped to the pavement. With the use of this instrument, data can be collected on number of vehicles, number of axles, speed, axle spacing, headway, axle weight, and gross vehicle weight. Weight accuracies are sufficiently accurate for engineering purposes, but not for enforcement.

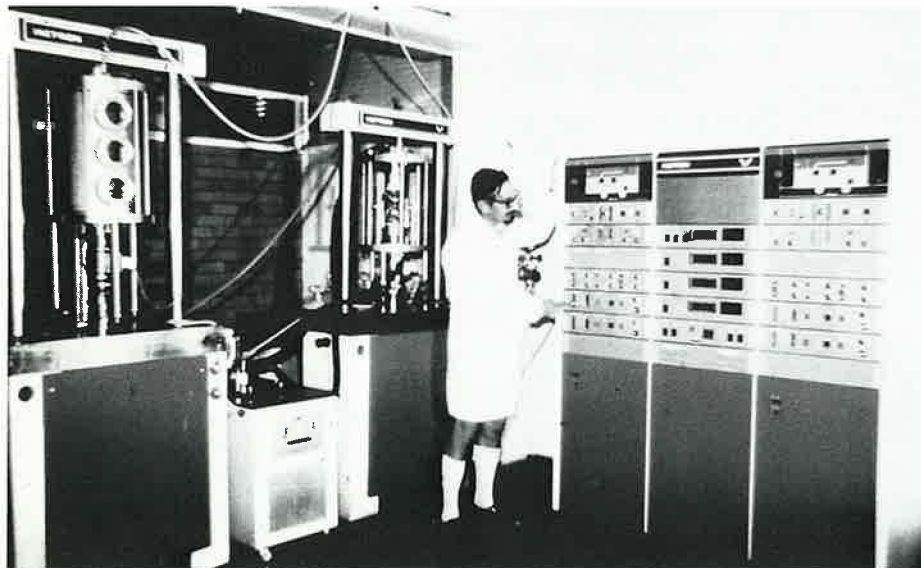
Kühn also expressed his organization's concern about serious damage to roads in South Africa being caused by overloading. The cost of this damage is estimated to be \$40 million annually.



Heavy vehicle simulators (HVS) operated by the National Institute for Transport and Road Research in South Africa (*lower right*, the first device built in 1970; *above and lower left*, later models operated after 1977).

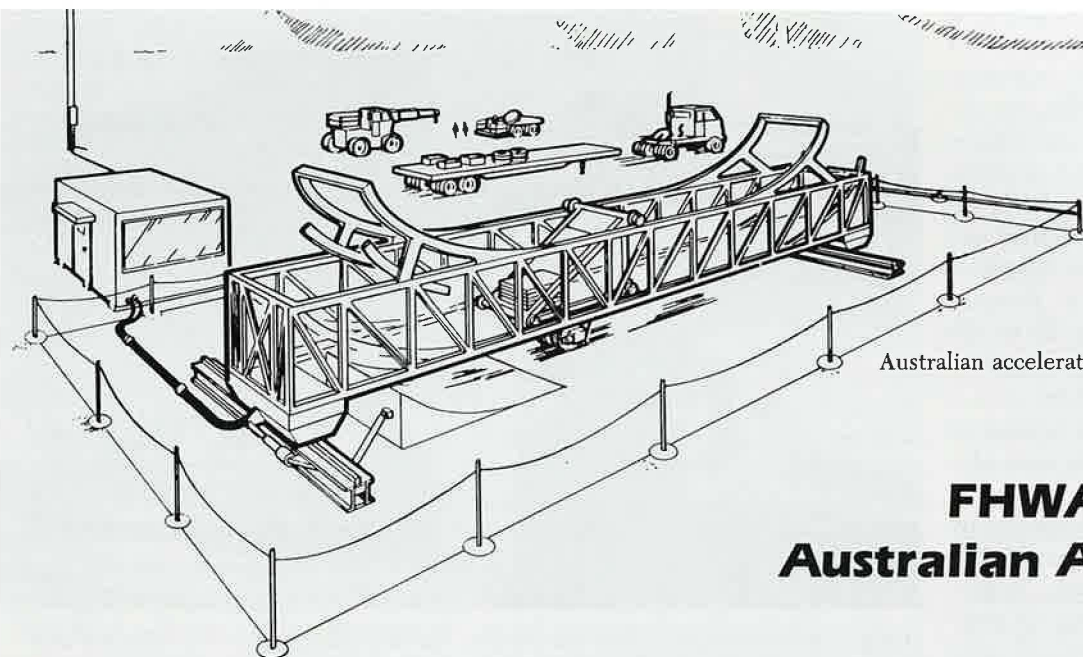


HVS operating with dual wheel load.



Triaxial testing of samples taken from an HVS site, South Africa.





Australian accelerated loading facility (ALF).

## FHWA Acquires Australian ALF Design

Acquisition of an accelerated pavement testing system similar to the Australian accelerated loading facility (ALF) was one of the recommendations of the Pavement Testing Conference held in March 1984 at the Turner-Fairbank Highway Research Center (TFHRC), McLean, Virginia. It was also recommended that machines in existence in other countries be investigated and that the first such machine acquired in the United States be operated by the FHWA at the TFHRC.

The ALF is a transportable device used to apply controlled wheel loads to pavement test sections. It is capable of applying dual truck tire wheel loads ranging from 9,000 to 22,000 pounds at a rate of one load application in approximately 10 seconds. Thus the loading effects of many years of truck traffic can be simulated in only a few months.

In September 1984, the FHWA signed an agreement with the New South Wales Department of Main Roads for the plans, specifications, and authorization to build a single ALF machine. A contract for the fabrication of the U.S. ALF was awarded to Engineering, Inc., Hampton, Virginia, in July 1985. The machine is currently nearing completion and is

expected to be installed at TFHRC in August 1986. It contains all of the refinements incorporated into the Australian ALF. Although no significant modifications in the design have been made, there have been some minor changes; for example, parts have been strengthened and several design improvements have been made in the way the motors are attached to the frame.

A 3- to 4-month shakedown period will follow installation of the ALF, after which a series of tests will be conducted. In a joint venture with Engineering, Inc., Pennsylvania State University will perform the pavement research activities; Engineering, Inc., will be responsible for the maintenance and operation of the ALF. The FHWA will provide the overall direction and management of the testing program. It is anticipated that the ALF's capabilities can be used in both long-term pavement performance and asphalt research areas.

The Australian ALF was designed and manufactured by the New South Wales Department of Main Roads and is owned and operated by the Australian Road Research Board (ARRB). It has been used continuously in pavement tests since July 1984. The first pavement test using the ALF

was conducted on a newly constructed section of the Sydney-Newcastle Freeway in New South Wales, Australia. The freeway consisted of an asphalt layer over a graded macadam base, a single-sized macadam subbase, and a lime-stabilized subgrade. Wheel load passes corresponding to 11.5 million equivalent single axle loads (ESALs) were applied during the test, and the limited results obtained so far suggest that the pavement performed in accordance with design expectations. However, a more detailed analysis of pavement data collected at regular intervals during the test will be required before this can be confirmed. Experience gained during the first test indicates that a 50 percent overall utilization rate is an achievable target for ALF operations, which corresponds to about 140,000 load passes per month.

As the Australians have gained experience in operating the ALF, the mechanical utilization of the machine has increased from approximately 25 to 73 percent of the available testing time. This increase in utilization has been primarily derived from minor modifications to the ALF to enhance its reliability.



## Australia

John Metcalf,  
Australian Road  
Research Board



in altering regulations for commercial vehicles.

At the International Roundtable, Metcalf announced plans for the ARRB/Road Engineering Association of Asia and Australasia Conference to be held in Adelaide in August 1986, which is expected to attract participants from developing countries.

Masao Shibata,  
Ministry of  
Construction, Japan



## Japan

John Metcalf of the Australian Road Research Board (ARRB) discussed his country's recent completion of 25 years of road research. The ARRB was established as a national center for research and information services; more than 15 to 20 percent of the organization's \$4.5 million expenditure is devoted to information services, a measure of the importance ARRB places on this activity.

ARRB has developed an accelerated loading facility (ALF) that can apply loads up to 80 kilonewtons, with up to 1 million equivalent standard axle loads on a highway section in a period of about 3 months. Some local street designs have failed early under ALF loading, leading to newer and more appropriate designs. (See accompanying box for details on the Australian ALF and a similar device to be installed by FHWA.) ARRB has also used a strain-gauge amplifier on bridges and culverts to weigh vehicles in motion.

Metcalf discussed ARRB work in developing mainframe and microcomputer formats for analysis of traffic flow in the design of signalized intersections. In addition, videotaping of traffic scenes has been utilized by ARRB for analysis of vehicle movements in complex intersections.

Overloading of trucks is an issue of concern in Australia, according to Metcalf, not only as a cause of pavement damage, but also as a cause of rollover accidents involving hazardous materials. These concerns have led to a study of lateral stability of articulated fuel tankers, which has been instrumental

Masao Shibata of the Ministry of Construction in Japan described the work of the Public Works Research Institute (PWRI), which is devoted to design and construction aimed at catching up with increased traffic growth. Planning activities include traffic-volume surveys, demand forecasting, a futuristic look at dual-mode buses and trucks, and environmental analysis. Regarding design and construction, Shibata shared his country's concerns about pavement materials, design, and recycling techniques,

the latter necessitated by the absence of disposal sites.

Large, major bridges, often with deep-water foundations in areas susceptible to typhoons and earthquakes, are commanding attention; at PWRI designs are being tested in wind tunnels and on shaking tables (earthquake simulators). Also, because of the frequent use of long tunnels, major testing of designs is being conducted in the full-scale tunnel section in order to evaluate ventilation, lighting, and other safety features. Shi-

## 1987 INTERNATIONAL ROUNDTABLE

The 1987 International Roundtable will be held in the Sheraton Washington Hotel, Monday afternoon, January 12, 1987, during TRB's 66th Annual Meeting.

At its midyear meeting in Washington, D.C., in May, TRB's Committee on International Activities, chaired by Robert A. Hubbard, received and acted on the report of its Roundtable Subcommittee, chaired by Harold King with members Ronald Pulling and William Harris. The subcommittee noted that the success of the outstanding Roundtable in January 1986 resulted from a format that should be continued.

Accordingly, the decision was made to invite individual speakers to discuss specific, major transportation

projects throughout the world. Twelve such projects were selected for presentation with the expectation that all or most will be included in the Roundtable program. Among the major projects chosen are the Osaka, Japan, Off-Shore Airport; the English Channel Tunnel; the Saudi Arabian International Airports; the Second Bosphorus Bridge; and the Canadian Rockies Tunnel.

The Roundtable again promises to be of considerable interest to Annual Meeting participants from outside the United States; however, because of the nature of the presentations in 1987, it is expected to prove highly attractive to participants from this country as well.

bata indicated that, as in most countries, the effects of salt use on concrete in structures is of major concern.

In the operation, safety, and maintenance areas, customary studies of traffic control and roadside safety are being supplemented with work in highway advisory radio, automatic vehicle classification, and vehicle navigation systems. Pavement and bridge management systems are also being actively pursued.



Transport Canada is conducting a study on Arctic marine travel.

## Canada

Robert R. Mayes,  
Transport Canada



Robert R. Mayes, Director-General of Research and Development at Transport Canada, provided an overview of his organization's six current research priorities: (a) transportation for the elderly and handicapped, (b) transportation of energy, (c) efficient use of energy, (d) transportation safety in all modes, (e) transportation productivity, and (f) environmental impacts.

Mayes discussed a program to study Arctic marine travel that has yielded major findings during the past 5 years

on the mechanics between ships and ice; this program may result in an extension of the shipping season. Ship navigation in ice has been greatly improved through better surveillance and communication; a second 5-year program will be aimed at improved safety, environmental factors, and the capability of transporting energy resources from the high Arctic.

Also described by Mayes are rail research projects dealing with electrification, end-of-train monitors, advanced train control strategies, and the integrity of tank cars during fire. In one major experiment, in which electrification was required due to the high cost of ventilation for two long tunnels, actual cost data on construction and operation were obtained that will have an impact on future policy decisions. The use of a new rail profilometer has produced substantial cost savings through modification of grinding patterns and frequencies.

In the provision of transit for the handicapped, Transport Canada has developed an intercity bus with an elevator that permits access by persons in wheelchairs. Wheelchair restraints have been tested and found satisfactory at bus speeds of up to 50 km/h.

In the highway mode, Transport Canada is nearing the final phase of a multi-year, multimillion-dollar cooperative research program on heavy-vehicle weights and dimensions carried out jointly with the provinces and industry. The results from this project have been publicized at the recent symposium in

Rail electrification is one of the research projects under study at Transport Canada.





British Columbia at which direct comparisons were made with work in the United States and other countries.

Finally, Mayes described the development of the B-Dolly converter, a double draw bar between lead and following trailers that enhances stability. He also described the development of a method to convert a flatbed trailer into a bulk trailer in an attempt to eliminate costly one-way hauls.

H. Carl Munson, Jr., The Boeing Commercial Airplane Company



Francis B. Francois, American Association of State Highway and Transportation Officials



## United States

Lester P. Lamm, Federal Highway Administration



The international perspectives of the Federal Highway Administration (FHWA), U.S. Department of Transportation, were addressed by Lester P. Lamm, former Deputy Federal Highway Administrator and current President of the Highway Users Federation. Lamm reviewed the history of FHWA efforts to bring transportation technology to bear on road development in less developed countries, including those countries through which the Pan American Highway system passes. He recounted positive, mutual exchange efforts between the FHWA and more than 70 different countries during the past 50 years. Some 400 visitors from outside the United States take advantage of FHWA's standing offer to assist with arrangements of visits not only to the FHWA, but also to the states, universities, and other agencies. Having been directly involved in development of

SHRP since its inception, Lamm briefly discussed the mutual benefits available to SHRP and to road research programs in other countries through their direct participation.

H. Carl Munson, Jr., a member of the TRB Executive Committee and Vice President of the Boeing Commercial Airplane Company, discussed research needs in air transportation from an international perspective. His remarks appear in this issue beginning on page 22.

Francis B. Francois, a member of the TRB Executive Committee and Executive Director of the American Association of State Highway and Transportation Officials (AASHTO), was the final speaker at the International Roundtable. Noting that AASHTO represents the departments of highways and transportation in the 50 states, the District of Columbia, and Puerto Rico, he called attention to the affiliate memberships held for mutual benefit by several Canadian provinces, Guam, Hong Kong, and the Virgin Islands. AASHTO is encouraging such affiliate memberships by comparable agencies in other countries to facilitate regular exchanges of information.

Francois described several technical documents that have recently been published by AASHTO, including *Guide for the Design of Pavements* (both rigid and flexible). The guide will be followed by research on developing an empiric method for designing pavement. AASHTO will update the guide every 2 years to incorporate findings from the Strategic Highway Research Program

(SHRP). *The 1984 Guide to the Geometric Design of Highways* has been widely distributed and also will be updated biannually.

A multimillion-dollar endeavor by AASHTO to develop computer software was noted by Francois; with the cooperation and contributions of individual states, new software is being created and maintained. Special programs include the Bridge Analysis and Rating System and the Roadway Design System that is now being merged into an Interactive Graphics Roadway Design System. AASHTO is moving toward development of a Bridge Design System and is exploring interest in a Bridge Management System, in addition the purchase of rights to the Bid Analysis and Management System. This emphasis on computer systems is targeted at doing more with less and doing a better job more rapidly.

Francois also mentioned the Crescent Study, which is a cooperative venture among western and southwestern states to test weigh-in-motion and automatic vehicle-identification equipment with the goal of improving the quality of highway data. Cooperation is also being provided by the trucking industry and the Roads and Transportation Association of Canada.

In conclusion, Francois commented on AASHTO's recent interest and activities in the international arena for the purpose of encouraging a greater exchange of views between state agencies and comparable agencies in other nations.