Office of International Programs
FHWA/US DOT (HPIP)
400 Seventh Street, SW
Washington, DC 20590

Tel: 202-366-9636
Fax: 202-366-9626

international@fhwa.dot.gov
www.international.fhwa.dot.gov

Publication No. FHWA-PL-04-010
HPIP/10-04(4M)EW

Traffic Safety Information Systems

In Europe and Australia

U.S. Department of Transportation
Federal Highway Administration
International Technology Exchange Program

OCTOBER 2004

NOTICE

The publication of this document was sponsored by the U.S. Federal Highway Administration under contract number DTFH61-99-C00005. awarded to American Trade Initiatives, Inc. Any opinions, options, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect those of the U.S. Government, the authors' parent institutions, or American Trade Initiatives, Inc.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-PL-04-010		

4. Title and Subtitle	5. Report Date
Traffic Safety Information Systems in Europe and Australia	October 2004
	6. Performing Organization Code
7. Author(s) Mike Crow, Michael L. Halladay, Susan Martinovich, Barbara Hilger DeLucia, David L. Harkey, Donald J. McNamara, James W. Ellison, J. Kevin Lacy, Betty L. Serian, Michael S. Griffith, Scott MacGregor	8. Performing Organization Report No.
9. Performing Organization Name and Address American Trade Initiatives P.O. Box 8228 Alexandria, VA 22306-8228	10. Work Unit No.(TRAIS)
	11. Contract or Grant No. DTFH61-99-C-0005
12. Sponsoring Agency Name and Address Office of International Programs Office of Policy Federal Highway Administration U.S. Department of Transportation	13. Type of Report and Period Covered
	14. Sponsoring Agency Code

15. Supplementary Notes
FHWA COTR: Hana Maier, Office of International Programs

16. Abstract
Safety data is key to making sound decisions on the design and operation of roadways, but the quality of many States' crash databases has eroded because of resource reductions. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program sponsored a scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems.

The U.S. delegation found that, similar to the United States, the countries face a drop in crash documentation by law enforcement agencies, but they are developing creative methods for estimation, linkage, and integration to limit the amount of data collection required. The team also noted that safety is a core function with high-level support in the countries visited, and identified several themes that support a coordinated approach to managing safety data.

The scanning team's recommendations for U.S. application include advancing safety themes in the areas of strategy, efficiency, and utility in a project to develop a more comprehensive approach to improving information systems. The team also recommends conducting a U.S. scan to determine best practices for collecting and sharing safety data, simplifying data collection by increasing automation, and evaluating new technologies to improve data collection and management.

17. Key Words	18. Distribution Statement
safety data, traffic safety information systems, fatality rate, data collection, data estimation, crash investigation	No restrictions. This document is available to the public from the Office of International Programs FHWA-HPIP, Room 3325 US Dept. of Transportation Washington, DC 20590 international@fhwa.dot.gov www.international.fhwa.dot.gov

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	112	Free

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Traffic Safety Information Systems in Europe and Australia

Prepared by the Scanning Team:

Michael L. Halladay
FHWA
Co-Chair

James W. Ellison
Pierce County Public Works
and Utilities

Scott MacGregor
California Highway Patrol

Susan Martinovich
Nevada DOT
Co-Chair

Michael S. Griffith
FHWA

Donald J. McNamara
NHTSA

Mike Crow
Kansas DOT

David L. Harkey
UNC Highway Safety
Research Center

Betty L. Serian
Pennsylvania DOT

Barbara Hilger DeLucia
Data Nexus, Inc.

J. Kevin Lacy
North Carolina DOT

AND

American Trade Initiatives, Inc.

LGB Associates, Inc.

FOR THE

Federal Highway Administration
U.S. Department of Transportation

American Association of State Highway
and Transportation Officials

National Cooperative Highway Research Program
(Panel 20-36)
of the Transportation Research Board

OCTOBER 2004

FHWA INTERNATIONAL TECHNOLOGY EXCHANGE PROGRAM

The Federal Highway Administration's (FHWA) Technology Exchange Program accesses and evaluates innovative foreign technologies and practices that could significantly benefit U.S. highway transportation systems. This approach allows for advanced technology to be adapted and put into practice much more efficiently without spending scarce research funds to recreate advances already developed by other countries.

The main channel for accessing foreign innovations is the International Technology Scanning Program. The program is undertaken jointly with the American Association of State Highway and Transportation Officials (AASHTO) and its Special Committee on International Activity Coordination in cooperation with the Transportation Research Board's National Cooperative Highway Research Program Project 20-36 "Highway Research and Technology – International Information Sharing," the private sector and academia.

FHWA and AASHTO jointly determine priority topics for teams of U.S. experts to study. Teams in the specific areas being investigated are formed and sent to countries where significant advances and innovations have been made in technology, management practices, organizational structure, program delivery, and financing. Scan teams usually include representatives from FHWA, State departments of transportation, local governments, transportation trade and research groups, the private sector, and academia.

After a scan is completed, team members evaluate findings and develop comprehensive reports, including recommendations for further research and pilot projects to verify the value of adapting innovations for United States use. Scan reports, as well as the results of pilot programs and research, are circulated throughout the country to State and local transportation officials and the private sector. Since 1990, FHWA has organized more than 50 international scans and disseminated findings nationwide on topics such as pavements, bridge construction and maintenance, contracting, intermodal transport, organizational management, winter road maintenance, safety, intelligent transportation systems, planning and policy.

The International Technology Scanning Program has resulted in significant improvements and savings in road program technologies and practices throughout the United States. In some cases, scan studies have facilitated joint research and technology sharing projects with international counterparts, further conserving resources and advancing the state of the art. Scan studies have also exposed transportation professionals to remarkable advancements and inspired implementation of hundreds of innovations. The result: large savings of research dollars and time, as well as significant improvements in the nation's transportation system.

For a complete list of International Technology Scanning topics and to order free copies of the reports, please see the list contained in this publication, as well as:
Website: www.international.fhwa.dot.gov or E-mail: international@fhwa.dot.gov

International Technology Scanning Program: Bringing Global Innovations to U.S. Highways

Safety

Traffic Safety Information Systems in Europe and Australia (2004)
Signalized Intersection Safety in Europe (2003)
Managing and Organizing Comprehensive Highway Safety in Europe (2003)
European Road Lighting Technologies (2001)
Commercial Vehicle Safety Technology and Practice in Europe (2000)
Innovative Traffic Control Technology and Practice in Europe (1999)
Road Safety Audits – Final Report and Case Studies (1997)
Speed Management and Enforcement Technology: Europe and Australia (1996)
Safety Management Practices in Japan, Australia and New Zealand (1995)
Pedestrian and Bicycle Safety in England, Germany and the Netherlands (1994)

Planning and Environment

European Right-of-Way and Utilities Best Practices (2002)
Wildlife Habitat Connectivity Across European Highways (2002)
Sustainable Transportation Practices in Europe (2001)
National Travel Surveys (1994)
European Intermodal Programs: Planning, Policy and Technology (1994)

Policy and Information

European Practices in Transportation Workforce Development (2003)
Emerging Models for Delivering Transportation Programs and Services (1999)
Acquiring Highway Transportation Information from Abroad (1994)
International Guide to Highway Transportation Information (1994)

Operations

Superior Materials, Advanced Test Methods, and Specifications in Europe (2004)
Freight Transportation: The Latin American Market (2003)
Intelligent Transportation Systems and Winter Operations in Japan (2003)
Traveler Information Systems in Europe (2003)
Meeting 21st Century Challenges of System Performance Through Better Operations (2003)
Freight Transportation: The European Market (2002)
Methods and Procedures to Reduce Motorist Delays in European Work Zones (2000)
European Winter Service Technology (1998)
European Traffic Monitoring (1997)
Traffic Management and Traveler Information Systems (1997)
Snowbreak Forest Book – Highway Snowstorm Countermeasure Manual (Translated from Japanese) (1996)
Winter Maintenance Technology and Practices – Learning from Abroad (1995)
Advanced Transportation Technology (1994)

Infrastructure—General

Contract Administration: Technology and Practice in Europe (2002)
Geometric Design Practices for European Roads (2001)
International Contract Administration Techniques for Quality Enhancement (1994)

Infrastructure—Pavements

Pavement Preservation Technology in France, South Africa and Australia (2002)
Recycled Materials In European Highway Environments (2000)
South African Pavement and Other Highway Technologies and Practices (1997)
Highway/Commercial Vehicle Interaction (1996)
European Concrete Highways (1992)
European Asphalt Technology (1990)

Infrastructure—Bridges

Performance of Concrete Segmental and Cable-Stayed Bridges in Europe (2001)
Steel Bridge Fabrication Technologies in Europe & Japan (2001)
European Practices for Bridge Scour and Stream Instability Countermeasures (1999)
Geotechnical Engineering Practices in Canada and Europe (1999)
Advanced Composites in Bridges in Europe and Japan (1997)
Asian Bridge Structures (1997)
Bridge Maintenance Coatings (1997)
Northumberland Strait Crossing Project (1996)
European Bridge Structures (1995)
Geotechnology – Soil Nailing (1992)

All publications are available on the Internet at
www.international.fhwa.dot.gov

Abbreviations and Acronyms

AAMVA	American Association of Motor Vehicle Administrators
AASHTO	American Association of State Highway and Transportation Officials
ABS	Antilock Braking System
AIS	Abbreviated Injury Scale
ANCIS	Australia's National Crash Indepth Study
ARRB	Australian Transport Research
AVV	Dutch Transport Research Center
BAC	Blood Alcohol Content
BASt	Germany's Federal Highway Research Institute
CARE	Community Road Accident Database
COPS	Computerized Operational Policing System
CPI	California Profilograph Index
CRSC	Community Road Safety Councils
DAL	Division of Analytical Laboratories
DART	Dutch Accident Research Team
DOT	Department of Transportation
EES	Equivalent Energy Speed
EU	European Union
FHWA	Federal Highway Administration
GIDAS	German Indepth Accident Study
Gipsi-Trac	Global Inertial Positioning System Integration Tracking Route Alignment and Crossfall
GIS	Geographic Information Systems
GPS	Global Positioning System
HSIS	Highway Safety Information System
IIHS	Insurance Institute for Highway Safety
IRI	International Roughness Index
IRTAD	International Road Traffic and Accident Database
LAC	Local Area Command
LRS	Linear Referencing System
MAA	Motor Accidents Authority
MUARC	Monash University Accident Research Center
NACE	National Association of County Engineers
NASS	National Automotive Sampling System
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NSW	New South Wales
OECD	Organisation for Economic Cooperation and Development
PAL	Police Assistance Line
RAMS	Road Asset Management System
RSRM	Road Safety Risk Manager
RTA	Roads and Traffic Authority

RTR	Roads and Transport Research Program
SHRP	Strategic Highway Research Program
SWOV	Institute for Road Safety Research
TAC	Transport Accident Commission
TADS	Traffic Accident Database System
TAIMS	Traffic Asset Inventory Management
TISPOL	European Traffic Police Network
TMC	Transport Management Center
TNO	Netherlands' Organization for Applied Scientific Research
TOPSTRB	Travel Options Planning ServiceTransportation Research Board
TRIU	Traffic Research and Intelligence Unit
UNC	University of North Carolina
USDOT	U. S. Department of Transportation
VicRoads	Victoria Roads Corporation
VMT	Vehicle Miles Traveled
VRU	Vulnerable Road Users
VSR	Vehicle Securities Register
WIM	Weigh-In-Motion
XLIMITS	Advisory Speed Limit Expert System

CONTENTS

List of Tables and Figures

FIGURES

TABLES

Executive Summary

Transportation policymakers, management, and staff continually must make decisions about the design and operation of the highway system. Making informed decisions on matters affecting highway safety is difficult because it requires an understanding of how safety is affected by the geometric design of the roadway, selection and placement of roadside hardware, use of traffic control devices, size and performance capabilities of vehicles, and needs and abilities of users. This understanding can be developed only through sound analysis of information on crashes, enforcement efforts, driver characteristics, roadway geometrics, traffic control devices, traffic volume data, and the location of roadside hardware and obstacles. It is important, therefore, that these data be available in a timely manner in computerized files, and be easily linked so that data can be assembled rapidly and prepared for analysis.

In the United States, the fatality rate per 100 million vehicle miles traveled (VMT) has essentially flattened. In figure 1, the bars show the frequency of fatalities, and the line shows the fatality rate. The U.S. Department of Transportation (USDOT) and other major stakeholder groups have adopted a goal to reduce fatalities to a rate of 1.0 by 2008. To meet this goal, it is more critical than ever to be able to analyze safety data to make informed decisions on the best methods for reducing fatalities.

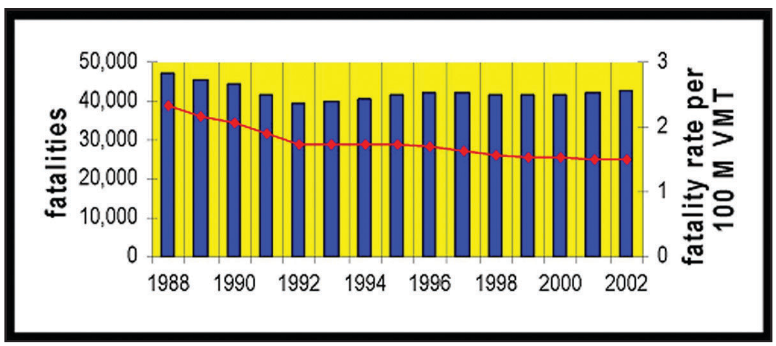


Figure 1. U.S. fatality rate.

BACKGROUND

A disturbing trend has been discovered through State traffic records assessments promoted by the National Highway Traffic Safety Administration (NHTSA) and the Federal Highway Administration (FHWA), as well as a recent evaluation of States for possible inclusion in FHWA's Highway Safety Information System (HSIS). The completeness and quality of many States' safety databases are eroding. With reductions in staff and other resources, a smaller proportion of motor vehicle crashes are reported to State crash databases than ever before. Crash thresholds are increasing to the point that any meaningful analyses are problematic, and because of data entry backlogs the information is outdated by the time the database is available for use. While States are increasing their use of geographic information systems (GIS) technology, they are not adequately maintaining or linking a record of the roadway characteristics associated with specific locations. Core data elements such as number of lanes, lane widths, shoulder widths, median type, and median width are missing in many systems, and items such as horizontal curve, vertical grade, intersection features, and interchange features are virtually nonexistent.

The highway safety community is working to create a brighter future for traffic safety information systems by searching for new ideas and ways of doing business. In October 2003, a panel sponsored by FHWA and the American Association of State Highway and Transportation Officials (AASHTO) conducted an international scanning study on traffic safety information systems. The objective of the panel was to seek innovative ways to build these systems by learning from countries that have achieved some level of success in designing, developing, and using them.

The panel conducted meetings with government agencies, academia, and private sector organizations in the Netherlands, Germany, and Australia. Discussions with these countries focused primarily on the following:

- General issues of policy, systems, and linkages
- Crash data collection and accessibility of routine and special traffic crash data
- Roadway data collection and accessibility of data describing roadways, roadside appurtenances, traffic control devices, structures, and traffic volumes
- Other traffic safety issues concerning driver information systems, enforcement, medical data, and adjudication

In addition, in a meeting with the European Commission in Brussels, team members discussed the European Union's (EU) efforts to combine minimal data from all EU countries into the Community Road Accident Database (CARE) for analysis and reporting of national statistics on crashes resulting in injuries and fatalities.

KEY SCAN FINDINGS

The most noteworthy similarity among the countries visited and the United States was the fact that fatalities have dropped significantly since 1980, but as shown in figure 1, the rate has been essentially constant in recent years. As in the United States, the countries the team visited face a drop in the documentation of crashes because their police agencies are unable to devote the necessary resources to this task. Each country is looking for new and innovative programs to improve marginal fatality rates while working with fewer resources and less traditional crash data than ever before.

The European Action Plan that serves as the guiding plan for the Netherlands and Germany, for example, sets a goal to reduce the number of injuries and fatalities by 50 percent between 2000 and 2010. The State of New South Wales in Australia has set a goal of about 40 percent reduction by 2010, and the State of Victoria in Australia aims to reduce fatal and serious injury crashes by at least 20 percent by 2007. As shown in figure 2, the U.S. goal for reducing the number of fatal crashes is slightly more than 21 percent by 2008.

Figure 2. U.S. goal for fatality reduction.

A strategic safety focus requires top leadership involvement, participation, and monitoring. In each country visited, roadway safety is a core business function that is supported at the highest level by the minister of transport and legislative bodies. Clear measures to improve roadway safety are set at a national level and communicated consistently to the states (or countries in the case of the EU). Each state then develops supporting goals and accountability measures to accomplish the national objectives. Figure 3 is an example of the road safety structure in Victoria, Australia. Each piece of this framework plays a key role in furthering the state's goals for roadway safety, from the Ministerial Council that ensures achievement of a coordinated approach to the Community Road Safety Councils (CRSC) that identify issues through community consultation and plan development.

As is the case in the United States, competing demands have eroded the resources the countries have available to devote to roadway safety. In particular, fewer police-reported crash data are available to identify safety problems and evaluate program successes. While the countries visited are in the process of developing more advanced data systems, many road safety accomplishments have been made without the benefit of robust and linkable data systems. Creative methods for data estimation, linkage, and integration strategies are used to limit the amount of data collection required and help eliminate data inconsistencies. To obtain sufficient crash data in the Netherlands, estimations are made of the missing and underreported crash data, and safety goals are established based on these estimated data.

The following are among the numerous methods used to obtain these estimates:

- Biannual public surveys are conducted to obtain personal estimates of the incidences and injuries for crashes involving motor vehicles, pedestrians, and issues, and a

Figure 3. Example of road safety structure in Australia.

- To some extent, data from insurance companies are used to provide additional information about material damage-only crashes, as well as to verify estimates of crashes involving injuries and fatalities.
- Hospital data, particularly from emergency room treatments, are factored into the estimation of crashes and injuries.

These estimations supplement police-reported crash data that have been evaluated carefully to determine the benefit-cost ratio of data elements collected. The Netherlands is seriously considering reducing the number of data elements collected by police officers from an already low number of 80 variables to 40 critical data elements. The EU aggregated database, CARE, requires only 43 data elements. All countries used indepth crash investigation studies to supplement their use of police-reported crash data for specific safety issues and research.

In addition to crash data estimations, the Netherlands has instituted an official "data-for-data partnership" to share information. Under a formal agreement between agencies, for example, an entire GIS roadway network file and capability for crash data analyses are provided to local agencies in return for their agreement to provide location coding for additions to the existing roadway network in their jurisdictions. In programs to improve crash data for safety analyses, each country worked extensively across agencies and jurisdictions to accomplish their goals.

Within the framework of making strategic safety improvements, roadway segments that may have potential for improvement before becoming "blackspots" (areas with high crash rates) are considered. Data are used to help support roadway work already accomplished, as well as proposed work. Benefit-cost analyses are continually applied and updated to justify the expenditure of resources for safety. In Australian states, for example, benefit-cost analyses are conducted first to justify a project, immediately after a project is completed to update cost measures, and then a year or more later to determine if intended benefits were indeed achieved.

An outgrowth of the proactive approach to roadway safety is communication to the public of safety issues, programs, and data that is of paramount importance in most of the countries visited. Numerous examples were provided to the scanning team of communicating safety issues, as well as training people to accept personal responsibility for avoiding involvement in crashes. These programs included the following:

- Web-based applications allowing access to statistical crash and roadway data
- Publications, billboards, and other public relations and marketing approaches to encourage crash prevention and train people to avoid crashes
- A continually staffed service center to provide a call-in help desk where local jurisdictions and others can obtain statistical crash data and technical assistance
- Marketing efforts to change drivers' attitudes to accept personal responsibility for staying safe

All of the countries visited use driver sanctioning as a means of improving driver behavior and roadway safety. Despite strong privacy laws in the Netherlands and Germany, some history and administrative information about drivers and vehicle owners are shared with law enforcement officials. Germany has an overall philosophy that sanctions lead to rehabilitation, and sanctions are removed from a driver's record at the end of the sanction period. German officials believe that sanctions should not be punitive. Instead, a driver who makes a mistake should be able to start again with a clean record. Australia uses a national driver database so driver sanctions and history are shared across the states to promote the concept of "one driver, one record, one license."

The goal of data estimation, sharing, and linkage is to simplify data collection in the field. To support German police officers, the German Institute for Traffic Engineering (a consortium of insurance companies supporting highway safety programs) provides extensive training programs and free crash data collection software. To varying degrees, the insurance industry served as a partner in promoting safety in all of the countries visited.

In addition to software to support crash data collection, the scanning team observed numerous other examples of new technologies being used to collect roadway data and existing technologies being used in new ways to support roadway safety programs. Use of GIS has become more important than ever to display data by location. This provides a method of analyzing disparate data from small databases without other means of linking these data. To support GIS efforts, extensive quality assurance steps are conducted to locate a crash or other incidents.

An example in Australia of using existing technology in new ways is the digital photographs collected during continuous roadway surveys. These digital photos are available online throughout the organization and are used to support crash data entry by helping to identify exact locations and roadway features surrounding the crash. This technology as deployed by ARRB Transport Research is shown in figure 4.

Another method for getting the most benefit out of existing technologies is to contract with private firms for the maintenance of equipment (traffic loops, for example) and require specific levels of service that result in no payment for times the equipment is not in operation.

The Australian states visited provided numerous examples of technologies used to maintain traffic flow and improve roadway safety. They included variable speed limit signs during peak congestion periods and adverse weather conditions, traffic

Figure 4. Digital imaging technology.

loop data to capture tailgating information, cameras for monitoring heavy vehicles, and cameras to ticket drivers for speeding or running red light signals.

IMPLEMENTATION STRATEGIES

The scanning team identified numerous safety data issues in the host countries in the areas of strategy, efficiency, and utility. The team selected the issues listed below as the most important themes to be used to develop recommendations and implementation strategies.

Strategy

- Top-level State and national support needs to be demonstrated. National-level creation of a set of measures should be followed with clear communication to the States. State leadership, in turn, should work to develop goals and ways to assess completion of those goals.

- Top-level meetings of stakeholder agencies in the public sector should have a singular focus on safety. Safety should be defined clearly as a core business, and performance measures should be established by which safety improvement can be assessed.

Efficiency

- A main goal is to streamline and simplify data collection, especially for the law enforcement officer in the field. This requires a review of data requirements and an eye toward quality assurance and collecting only the information needed.
- Current technology can be used more efficiently to simplify data collection (through linkage rather than field data collection) and improve overall data quality.
- New technology can be used where it will increase efficiency and/or improve data quality by also decreasing the amount of data collected onsite and through the use of edit checks or other quality assurance methods.

Utility

- Since use of safety data is a fundamental precursor to improving data quality, marketing traffic safety information is a crucial activity. Raising awareness of the issues and uses of data will in turn support data improvements.
- Analytical tools that help users get the most out of data and support specific job functions such as performance monitoring, evaluation, and countermeasure selection are crucial. Increasing access to data and availability of user-friendly analytical tools will help ensure data quality improvements.

These themes, as well as supplemental implementation recommendations and strategies, are presented in more detail in the team's *Scan Technology Implementation Plan*. The team will share its findings and promote its recommendations to constituencies through distribution of this report, published articles, and presentations at meetings and conferences.

CHAPTER ONE
INTRODUCTION

STUDY OBJECTIVE AND FOCUS AREAS

In October 2003, the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) co-sponsored an international scanning study on traffic safety information systems. The study objective was to seek innovative ways to build traffic safety information systems by traveling to countries that have achieved some level of success in designing, developing, and using these systems.

The purpose of the international scan process is to build on the successes of the Strategic Highway Research Program (SHRP) Implementation Task Force in the following areas:

- Close partnerships
- Strong communication and outreach
- Identifying technology champions
- Marketing technology
- Supporting implementation
- Providing a continuous assessment of outcomes

As shown in figure 5, the fatality rate per 100 million vehicle miles traveled (VMT) essentially has flattened in the United States after experiencing steady improvement for many years. In the figure, the bars show the frequency of fatalities, and the line shows the fatality rate. In 1990, 44,599 fatalities occurred for a rate of 2.08 per 100 million VMT. In 2002, 42,815 fatalities occurred for a rate of 1.51 per 100 million VMT.

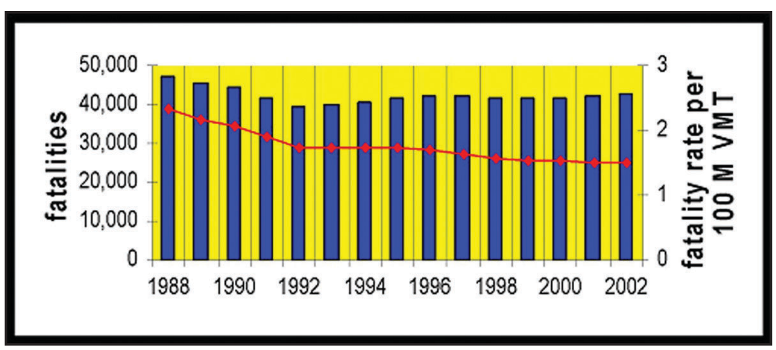


Figure 5. Plateau in U.S. motor vehicle fatality trends.

The U.S. Department of Transportation and other major stakeholder groups have adopted a goal to reduce fatalities to a rate of 1.0 by 2008. To meet this goal, it is more critical than ever to be able to analyze safety data to make more informed decisions on the best methods for reducing fatalities. For this scanning study, therefore, the panel's focus was the following:

- Discover and discuss technology for traffic safety information systems used successfully in other countries and share these experiences.
- Increase the awareness of underlying polices, processes, and capabilities that support outstanding safety information systems.
- Determine applicability of technologies and tools for use in the United States.

The panel conducted meetings with government agencies, academia, and private sector organizations in the Netherlands, Germany, and Australia. Discussions with these countries focused primarily on the following:

- General issues of policy, systems, and linkages
- Crash data collection and accessibility of routine and special traffic crash data
- Roadway data collection and accessibility of data describing roadways, roadside appurtenances, traffic control devices, structures, and traffic volumes
- Other traffic safety issues concerning driver information systems, enforcement, medical data, and adjudication

In addition, in a meeting with the European Commission in Brussels, team members discussed the European Union's efforts to combine minimal data from all EU countries into the Community Road Accident Database (CARE) for analysis and reporting of national statistics on crashes involving injuries and fatalities.

STUDY ORGANIZATION

FHWA and AASHTO sponsored the scanning study, and American Trade Initiatives, Inc., organized the meeting and travel logistics. The countries the team visited are shown in table 1, and the international contacts interviewed are listed in Appendix A.

Table 1. Scan locations and dates visited.

Country	Dates of Visit
The Netherlands	October 4–7, 2003
Germany	October 8–9, 2003
Australia (State of Victoria)	October 12–15, 2003
Australia (State of New South Wales)	October 16–17, 2003

The size of the countries visited during the study varies considerably. The Netherlands is about twice the size of New Jersey and in 2000 had some 16 million inhabitants. Germany is slightly smaller than Montana and in 2000 had 82.8 million inhabitants (roughly one-third of the U.S. population). Australia had only 20 million people in 2000, but it is physically almost as large as the United States. Within Australia, the scanning team visited the States of New South Wales and Victoria. Victoria has about 4.8 million inhabitants, making it the most densely populated state. At roughly the size of Minnesota, it is the smallest state in Australia. The 6.5 million population in New South Wales is slightly greater than that of Massachusetts, but New South Wales is larger in area than Texas and Kentucky combined.

PANEL COMPOSITION

Scanning team members were selected to represent the diversity of knowledge required to evaluate traffic safety information systems. The 11-member panel represented FHWA, AASHTO, National Highway Traffic Safety Administration (NHTSA), American Association of Motor Vehicle Administrators (AAMVA), National Association of County Engineers (NACE), academia, and other public and private sector organizations. Technical expertise included engineering, enforcement, drivers and motor vehicles, administration and policy, systems and technology, and traffic safety research. Team members and their organizations are listed in table 2. Contact information and biographic sketches for team members are in Appendix B.

Table 2. Team members and organizations.

Michael L. Halladay Office of Safety, FHWA	David L. Harkey University of North Carolina Highway Safety Research Center
Susan Martinovich Nevada Department of Transportation	J. Kevin Lacy North Carolina Department of Transportation
Mike Crow Kansas Department of Transportation	Scott MacGregor California Highway Patrol
Barbara Hilger DeLucia Data Nexus, Inc.	Donald J. McNamara Region 5, NHTSA
James W. Ellison Pierce County Public Works and Utilities NACE	Betty L. Serian Pennsylvania Department of Transportation AAMVA
Michael S. Griffith Office of Safety Research and Development, FHWA	

AMPLIFYING QUESTIONS

The scanning team developed a series of amplifying questions to help focus the discussion with the international safety experts and to define what subjects, topics, and issues were of particular interest to the team. These questions included general and policy issues, as well as detailed issues about both crash and roadway data. The general section included issues related to policy, systems, and data linkages. The crash section included questions relating to both routine crash data collection and special crash investigation teams. The roadway section included questions on all types of roadway-related data collection, including inventories, roadside appurtenances, traffic control devices and volumes, and structures.

Because of the amount of time required to cover these critical areas of interest, it was not possible to include questions about many of the other components of traffic safety information systems. During the course of the interviews and presentations, however, the team received supplemental information about driver and vehicle systems that has been included in this report.

The amplifying questions were provided to the international hosts before the scanning team's arrival, and the presentations made to the team at each site closely tracked the organization of those questions. For the visit to Germany, the questions were translated into German before the visit, and a translator participated in the meetings to ensure clarity of the discussions. The amplifying questions for this scanning study are provided in Appendix C.

IMPLEMENTATION

Because much work is being done already in the United States, the scanning team did not expect to find the countries visited using many new technologies to improve traffic safety information systems. Rather, the team attempted to identify actions or processes from these countries that could be introduced in the United States to enhance the current state of traffic safety information systems. Recommendations and strategies for implementation are outlined in Chapter Four of this report. A separate report will detail the team's implementation plan for tying these findings into the AASHTO Strategic Highway Safety Plan.

Chapter Two
Key Findings

As anticipated, the scanning team did not find technologies that were significantly different from those used in some States in the numerous efforts already underway to improve traffic safety information systems in the United States. Nevertheless, each country visited provided information with the potential to advance the effectiveness and utility of traffic safety information systems in the United States. In many cases, improvements addressed issues such as coordination, communication, and marketing efforts, rather than technology improvements.

This chapter summarizes the topics discussed and technologies observed in each country visited. Because of the overall context of the scan, it was often necessary to discuss traffic safety programs in general, as well as the systems that support those programs. The findings that the team members believe were most significant are summarized in Chapter Three, and implementation strategies are discussed in Chapter Four.

THE NETHERLANDS

The scanning team met with numerous representatives of the following groups in the Netherlands:

- Institute for Road Safety Research (SWOV)
- Ministry of Transport, Public Works, and Water Management (Rijkswaterstaat)
- AVV Transport Research Centre
- National Police Agency
- European Traffic Police Network (TISPOL)

Team members discussed a significant number of safety systems issues with the experts in the Netherlands. The items summarized in this report focus on the issues that dealt primarily with traffic safety information systems.

Overview

The Netherlands is about twice the size of New Jersey and in 2000 had some 16 million inhabitants. Its size is 42,000 square kilometers, of which 8,000 km^2 are waterways. By comparison, the United States has 280 million inhabitants, and its size is about 9.4 million km^2. The State of New York, for example, is larger than the Netherlands with some 128,000 km^2. The Netherlands has 2,300 km of motorways, compared to 74,000 km of interstate highways in the United States.

Rijkswaterstaat is composed of nine regional directorates, 12 provinces, 489 municipalities, seven greater city areas, and 48 water board districts. In addition to the responsibilities of Rijkswaterstaat for roadways, local provinces, municipalities, and water boards are responsible for their own roadways. The only police force in the country, the National Police Agency, consists of 25 police regions and 125 police districts.

Accident Databases and Traffic Safety Policy

In 2002, the Netherlands reported 1,082 fatalities and more than 18,000 serious injuries as a result of motor vehicle crashes. In the Netherlands, motor vehicles include traditional automobiles as well as bicycles, mopeds, electrical cars, and other means of motorized transport. Figure 6 compares the fatality rates per kilometer and per population between the Netherlands and the United States.

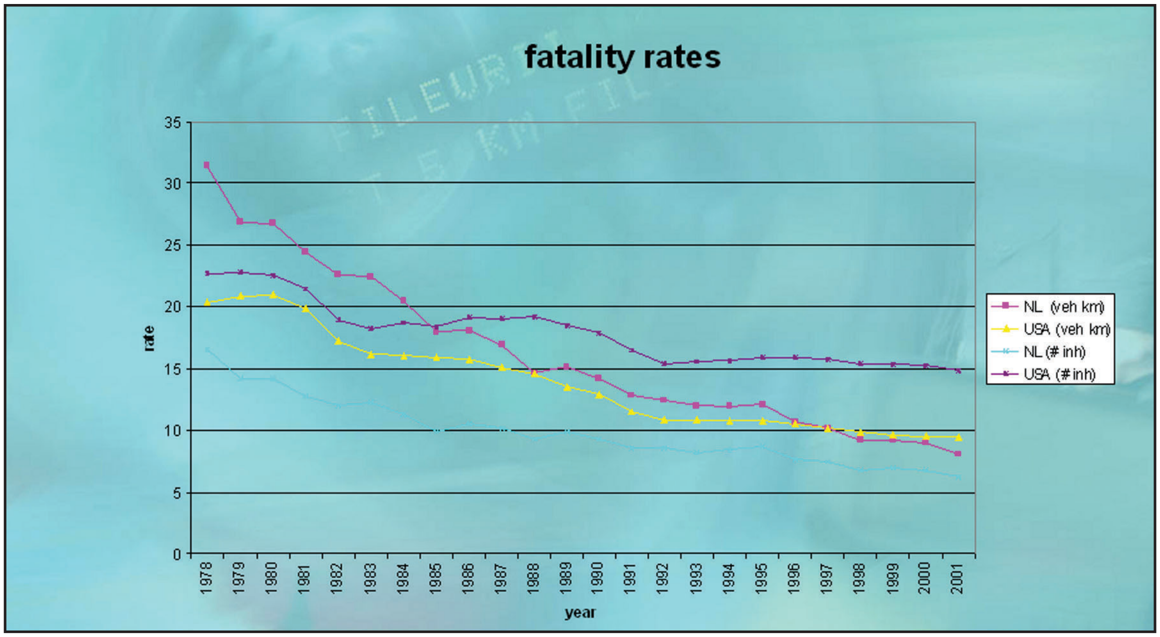


Figure 6. Comparison of fatality rates in the Netherlands and United States.

In 1985, the Netherlands set road safety targets to reduce crash injuries by 25 percent by the year 2000, and to reduce serious crash injuries by 50 percent and crash fatalities by 40 percent by the year 2010. To meet these targets, safety policies were focused on vulnerable road users (VRUs), and programs were established for the elderly, cyclists and mopeds, driving under the influence, safety devices, speeding, and heavy goods vehicles. While these programs were considered successful, the targets were not being met. Based on crash data and evaluation studies of the implemented programs, new targets were established for 2010 to have fewer than 950 fatalities and fewer than 17,500 persons hospitalized because of a crash.

Road Safety Research

AVV Transport Research Center, working for the Ministry of Transport and other governmental bodies active in the field of traffic and transport, considers road safety as a product with a target market. In this context, the center spells out six product groups: (1) freight transport, (2) nautical information, (3) road networks, (4) people transport, (5) traffic information, and (6) road safety.

Within the road safety product group, for example, AVV works on six “clusters,” or road safety programs. Clusters related to traffic safety information systems include constructing and maintaining basic data files, producing incidental and repetitive products based on these data files, and measuring the effects of road safety campaigns.

Construction and maintenance of basic data files. To estimate the real dimension of the road safety problem, AVV uses recorded data about fatal crashes, hospitalized crash participants, those injured who receive first-aid treatment, those slightly injured, and material damage-only crashes. These data do not exist in a single, consolidated crash database, but instead come from numerous databases and sources. For example, AVV has determined that VRUs are often underreported in research on mobility and safety. The traditional VRUs are those walking, bicycling, and riding mopeds or motorcycles. Crashes involving cyclists are the most underreported. To obtain this information, it has been necessary to look for supplemental data sources. This project to collect data for VRUs is discussed in more detail later in this section. Table 3 shows the difference between recorded crash data reported at the time of the accident, and estimated crash data for the same period. Road safety planning, implementation, and evaluation are performed using the estimated crash data, which are believed to represent the true dimension of the safety condition of the road. At the national level, funding allocation is based on crash data estimates.

Table 3. Reported and estimated crash injuries in 2001.

Injury Severity	Reported	Estimated
Killed	993	1,085
Hospitalized	11,029	18,510
First-aid treatment	13,917	92,000
• Treated by family doctor		80,000
• Treated on accident spot		14,000
• Self treated or no treatment		330,000
Slighty injured	17,864	424,000
Damage-only accidents	280,441	850,000

In a presentation, Peter Mak of AVV said that flexible and accessible databases that are stable, consistent, unified, harmonized, and up-to-date in time and content are the bricks of any system. To get this basic information, the important issues are the following:

- Data sets must be linkable using a single, unique key.
- Data sets and results must be available to a broad public.
- Processes must be flexible and adaptable.
- Other authorities, institutes, and companies must have access via the Internet.
- Metainformation on quality aspects is of major importance.
- Output from researchers is often basic information to be used as well.
- Careful maintenance of the data means matching needs and wants in a cost-effective and efficient manner.

Production of incidental and repetitive products based on data files. Incidental and repetitive products include analysis files, analysis applications, and standard reporting. Examples of routine applications include the mapped blackspots (areas with high crash rates) shown in figure 7 and road accidents on the Internet (www.rws-avv.nl) shown in figure 8. Examples of standard reports include reported accidents and casualties, risk ratings on national roads, and an annual input quality report.

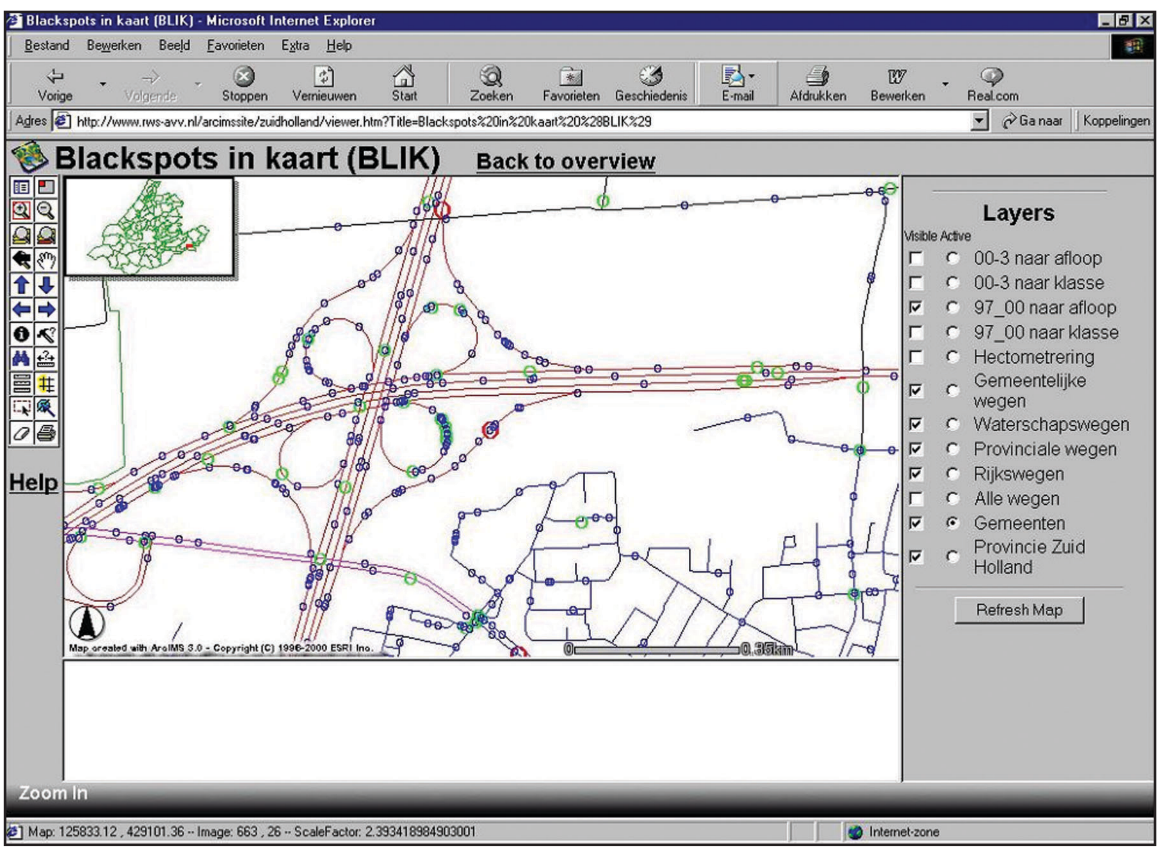
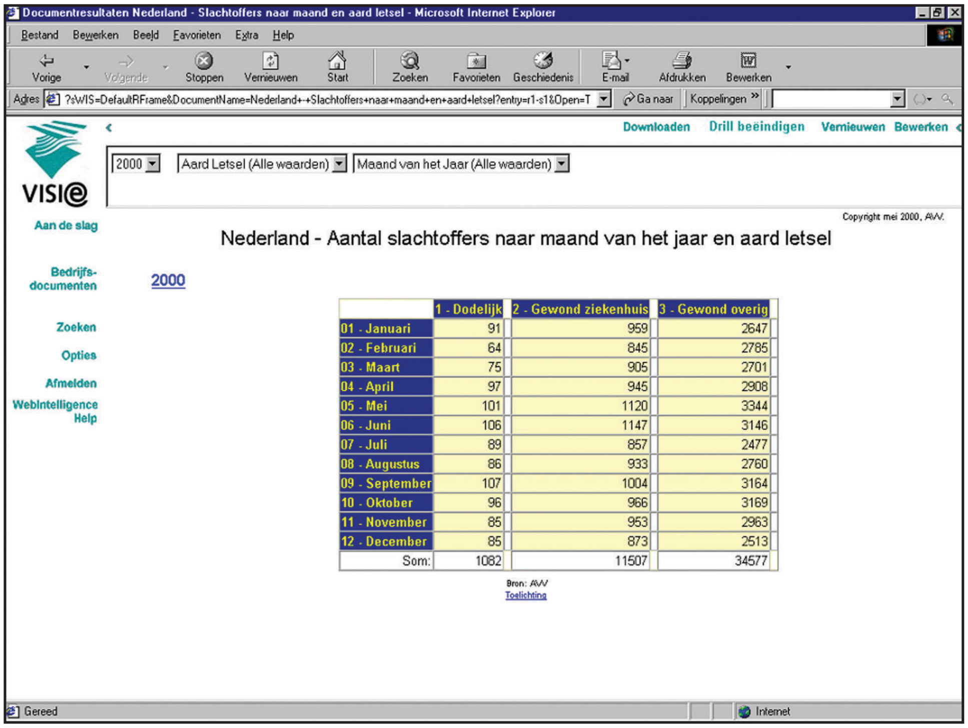


Figure 7. Example of mapped blackspots.


Nederland - Aantal slachtoffers naar maand van het jaar en aard letsel

2000

	1 - Dodelijk	2 - Gewond ziekenhuis	3 - Gewond overig
01 - Januari	91	959	2647
02 - Februari	64	845	2785
03 - Maart	75	905	2701
04 - April	97	945	2908
05 - Mei	101	1120	3344
06 - Juni	106	1147	3146
07 - Juli	89	857	2477
08 - Augustus	86	933	2760
09 - September	107	1004	3164
10 - Oktober	96	966	3169
11 - November	85	953	2963
12 - December	85	873	2513
Som:	1082	11507	34577

Figure 8. Example of road accidents on the Internet.

Measurement of the effects of road safety campaigns. Road safety campaigns are initiated to influence driver behavior, and the effectiveness of these campaigns is measured. Examples of road safety campaigns include those on drinking and driving, seatbelt use, bicycle lighting use, social costs of unsafe roads, periodic regional road safety surveys, and road safety bulletins. The biggest user of these products is the Ministry of Transport, followed by the National Road Administration, provinces and regional road safety organizations, municipalities, district water boards, research institutes, police, consultants, educational institutions, interest groups, students and citizens, and others.

Safety data information is marketed as a commodity, with more perceived value than just the available information. To market their products to customers, organizations focused on road safety stress communication, marketing (including market research and segmentation), promotional activities (including trade exhibitions and promotional objects), and feedback (including periodic meetings with customer groups and a service desk to answer questions). To further improve road safety products, a model shown in figure 9 illustrates efforts underway to introduce new sources of data. Introducing new data sources requires securing the quality and durability of basic data files, continuing the search for relevant data types, achieving the necessary knowledge to effectively use the new data sources, and keeping informed on traffic safety developments.

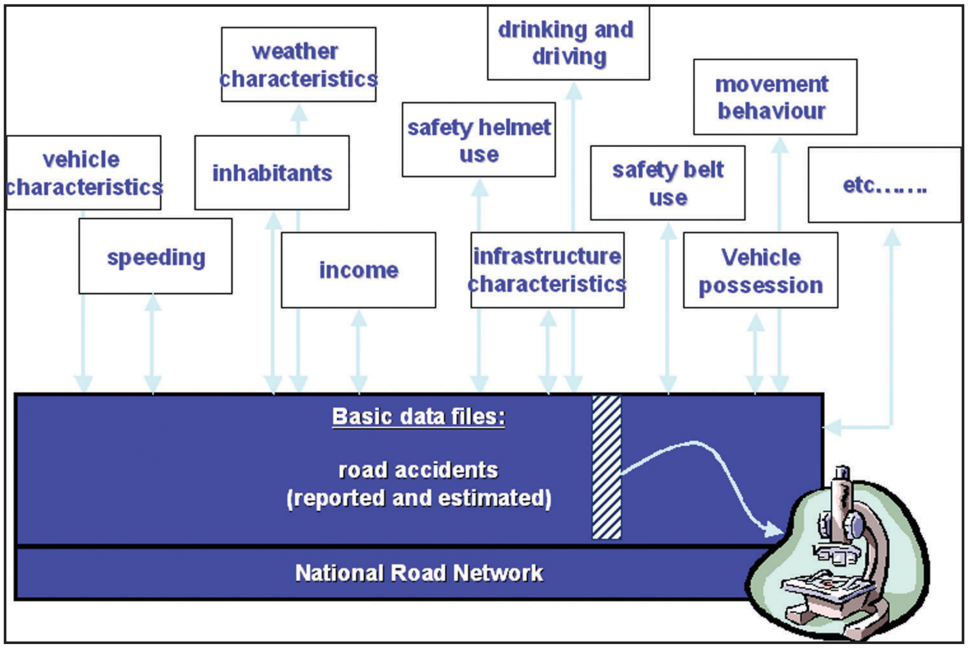


Figure 9. Introduction of new data sources.

Research and Data Used by SWOV

The Institute for Road Safety Research (SWOV) is a research foundation with a mission to contribute to road safety through scientific knowledge. It is an independent research institute with a user orientation that provides the following:

- Fundamental and anticipatory research with potential applications
- Planning office function, including analyses and forecasts
- Active dissemination of knowledge
- Interdisciplinary and international cooperation in road safety research

In the course of its numerous research activities, SWOV has identified needs for additional, continuous, or improved data in the following areas:

- Accidents
- Length
- Exact place
- Road user
- Linkage with vehicle database
- Experience, driver's license
- Exposure (trips, vehicle km)
- Safety performance Indicators

- Disaggregated data (road user, road category, vehicle)
- Continuous quality (time series)
- Prognosis
- Speeds on local and regional roads
- Roads
- Implementation and costs of measures
- Characteristics (sustainable safe categories)

To support the research activities in the institute, the SWOV planning office is responsible for providing information and support. The safety support activities of this department include the following:

- Data acquisition
- Data management, including data processing and quality control, internal databases, data dictionaries, and disclosure by information systems on the Intranet and Internet
- Consultation of users' needs for knowledge and information
- Further development of knowledge base on Web site

Research and Data Used by TNO

The mission of the Netherlands' Organization for Applied Scientific Research (TNO) is to apply technological knowledge with the aim of strengthening the innovative power of industry and government. One of its core areas of expertise is defense and public safety. Accident analysis within TNO in terms of the Dutch Accident Research Team (DART) includes the following activities:

- Statistical analysis of Dutch and European accident data
- Indepth crash research
- Indepth traffic accident research
- Reconstruction tools

In terms of indepth studies, TNO has collected data for studies about high traffic density, typical road layouts for bicycle and moped lanes, high number of bicycles, high number of heavy trucks at the Port of Rotterdam, and others.

Figure 10. Indepth crash research.

Examples of data collected by TNO include the following:

- General accident data (time, location, day, dark/light, etc.)
- Scene data (lanes, lane width, delineation, pavement type, defects)
- Vehicle data (type, engine, tempering, thread depth, maintenance, damage (collision deformation classification or CDC coding), airbag status, seatbelt use, internal damage)
- Accident reconstruction (speeds, delta-V, equivalent energy speed (EES), reaction times, subjective accident causes)
- Occupant data (age, gender, profession, health, experience in vehicle or at site)
- Injury data (injuries with abbreviated injury scale (AIS) coding, contact codes)

Examples of data identified by TNO that have been missing or would have been desirable for these studies include the following:

- Scene data (road surface properties such as roughness and friction coefficient)
- Vehicle data (internal alterations to the vehicle)
- Accident reconstruction (real deformation energy, braking marks with antilock braking systems (ABS), etc.)
- Occupant data (socially wanted answers, 30 to 50 percent of people do not respond)
- Injury data (medical data in case of no permission, terse autopsy reports, etc.)

TNO has been collecting indepth information on crashes involving non-passenger cars since 1999. More than 350 cases and an additional 200 control investigations provide a source of detailed information about particular crash types. Indepth accident analysis provides useful insight into the causes and consequences of road crashes and is considered important for monitoring new trends and the effects of certain measures.

Research and Data Used by the Road Authority

The Directorate Zuid-Holland is one of 10 regional authorities responsible for state roads in the provinces. This responsibility includes traffic flow, environment, and safety. Safety problems are assessed using data on crashes, exposure, and road characteristics. South Holland is the largest directorate and includes 18 percent of all state-maintained roadways, with 10.5 million vehicle km over 400 km of state roadways. Rijkswaterstaat is subject to political goals on traffic flow, environment, and road safety. To reach these goals during a period of decreasing budget, the directorate's orientation is changing from only maintaining the infrastructure to taking care of traffic flows as well by such methods as speed and incident management. Increased underreporting of crashes is regarded as a substantial problem because it makes it more difficult to focus attention on road safety or to identify priority locations for improvements.

Research and Data for Vulnerable Road Users

AVV believed that VRUs are often underreported in research on mobility and safety, including traditional VRUs such as those walking, cycling, and riding mopeds or motorcycles. The project on VRUs requires gathering data on the size of the problem, mobility, crashes and risks, measuring analysis, and other factors. To obtain this information, it has been necessary to look for supplemental data sources. Examples of new data sources include pedestrian diary projects, data from hospitals and family doctors, and additional questions on the behavior and opinion survey (known as PROV) sent out every 2 years to households throughout the Netherlands. Sample PROV questions include the following:

- Personal data and data on vehicle use
- Number of traffic accidents and fines
- Driver behavior in speeding, drunk driving, aggression, cell phone use, and seatbelt use
- Opinions on traffic safety measures

AVV routinely experiences a 70 percent return rate on the survey because of incentives provided to responders. AVV uses the data to supplement its safety research activities and compares it to data from previous surveys. An English translation of the most recently used PROV survey is in Appendix D.

Basic Information on Databases

AVV routinely maintains basic databases on the following and other data:

- Road network, including all levels of roads, rail, and inland waterways
- Features, including roads and inland waterways
- Accidents, including all roads and inland waterways

- Flows, including speeds, traffic jams, etc., on the national level
- Goods transport and origin-destination matrices
- Passenger transport, including use of modes, public transport, and commuters
- Inland and maritime shipping and flows
- Environmental data, including weather and exhaust fumes

Although the data are used primarily by the Ministry of Transport, they are also used by policymakers, engineers and designers, other road authority jurisdictions, private consulting firms and shippers, police, environmental researchers, and many others.

The National Road Network, shown in figure 11, is the information integrator for all of the data. The network began with street and cross-street coding to locate crashes, and was used this way for many years. It was reorganized in 1996 to bring together all of the networks in a GIS database.

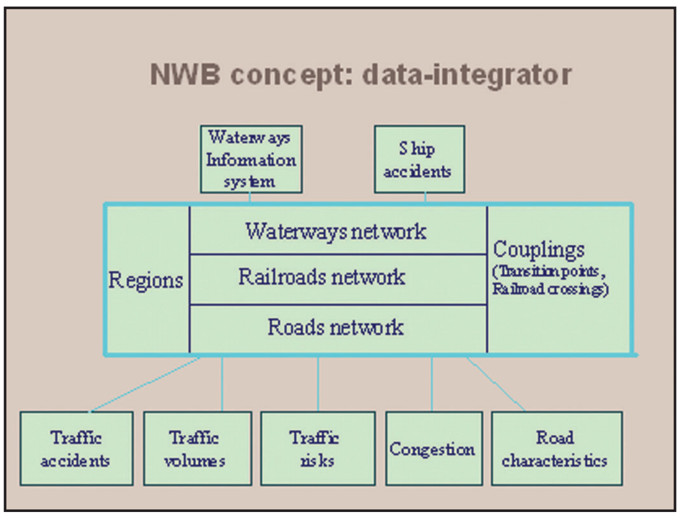


Figure 11. The network as information integrator.

This GIS network database includes 145,000 km of roadways and has been available since 1998 for all customers. Each month, a new file of ZIP Codes indicates where new roads have been constructed, and map agencies are contacted to follow up on these system updates. In what is called a "data-for-data partnership," agreements are made between AVV and regional or community jurisdictions to provide updates to their portion of the roadway network in exchange for being able to access the information in the network. This way, localities provide information such as locations, drawings of new streets, and road attributes in exchange for access to all other data linked to the network.

In the accident reporting process used in the Netherlands, AVV staff is responsible for the quality control of location coding. Staff members use the capabilities of the

National Road Network GIS to drill down to the appropriate location to verify that it matches the law enforcement officer's description of the location in the accident report form. An example of the level of detail provided by the road network GIS is illustrated in figure 12.

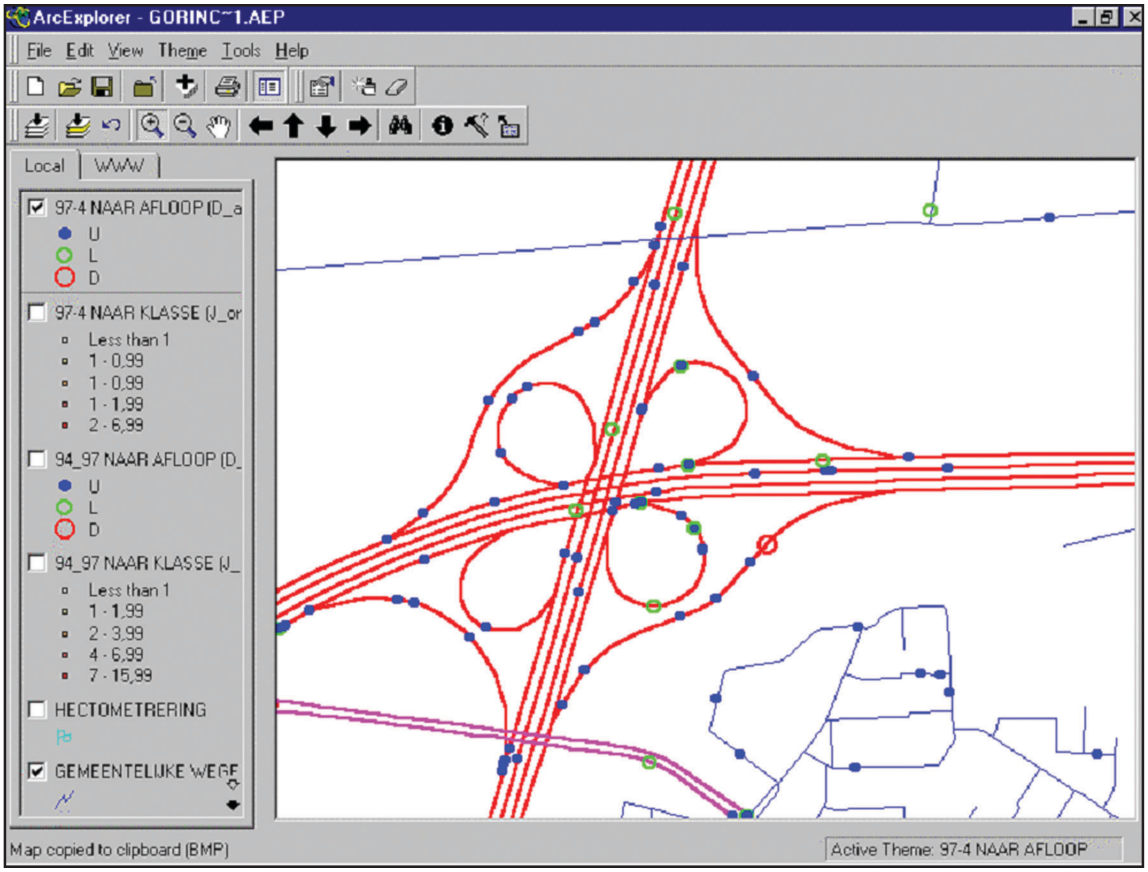


Figure 12. Road network intersection detail.

To address the problem of underreporting of different types of crashes, a new proposition for a road accident reporting system will incorporate the following benefits:

- Easier and more timely reporting
- Multiple methods for AVV to accept accident data from the police
- Lower training costs because of the new system's simplicity
- No technical adjustments required within police agencies
- Enriched data with data from other sources
- Better quality control of data

As part of this effort to simplify the system, the Netherlands is evaluating the 80 data elements now collected in the field to determine if it is possible to reduce the number to about 40 elements. Officials expect that these police-collected data will be enhanced by linkage to other data sources, as well as by additional sampling techniques.

TISPOL

In addition to researching new methods for collecting and managing traffic safety data, the European Union is attempting to stimulate cooperation among the various police agencies, both within their own countries and on the EU level. As a response, TISPOL, the European Traffic Police Network, a police network similar to the International Association of Chiefs of Police in the United States, was created. TISPOL serves as a network for traffic police forces to improve conditions for cooperation by developing a common EU police strategy on road safety tasks and to provide a higher police profile on the EU level.

GERMANY

Germany is slightly smaller than Montana and in 2000 had some 82.8 million inhabitants (roughly one-third of the population of the entire United States). In Germany, the scanning team met with representatives of the following groups:

- Federal Highway Research Institute (BASt)
- National Police Leadership Academy
- Accident Research Unit
- Medical University of Hanover
- GIS CONSULT
- German Institute for Traffic Engineering

Team members discussed a significant number of safety systems issues with the German experts. A translator was used during these discussions to be certain that the ideas and issues were clearly communicated.

Overview

Germany is 356,970 km^2 or about the size of Montana. Its population of 82.8 million inhabitants, however, is roughly the equivalent of the populations of California, Texas, New York, and Virginia combined. Much of the traffic safety activity in Germany occurs through legislatively mandated local accident commissions composed of police officers and representatives of the road construction and traffic authorities. Since 1971, these local accident commissions have been required to meet and investigate high-risk safety locations (identified by crash records) and determine solutions to the safety concerns at these locations. These local accident commissions have formalized and made commonplace the process of multidisciplinary local safety analysis in Germany.

Federal Highway Research Institute

The Federal Highway Research Institute (BASt) was founded in Germany after the highest number of traffic fatalities (20,000) was experienced. BASt uses both national and international data for developing accident statistics and analysis. The International Road Traffic and Accident Database (IRTAD) is supported at BASt and consists of high-level aggregate data from 30 countries and four continents.

On a national basis, BAST receives all crash data from the 16 German states within 6 months after the end of the year. These data are collected using a national form, with some states adding supplements for other information they wish to collect. The states maintain their own data files for their work, and these data are available on their accident databases within 30 days of the crash. No personal data, except for birth year, are provided to BASt. While underreporting of crashes is a concern, only an estimated 5 percent of crashes involving fatalities or injuries are missing from the databases, and these are believed to be mostly crashes involving pedestrians or bicyclists.

In addition to crash data, BASt has available or maintains information about population, vehicles, roadway kilometers, distances traveled by cars, seatbelt and child restraint use, and other types of data.

National Police Leadership Academy

All police officers receive consistent and comprehensive traffic safety training through the National Police Leadership Academy. This training includes accident analysis, site inspection, immediate and long-term safety measures, evaluation techniques, and more. Germany has two federal police forces, as well as local police agencies, many of which have different laws and use different crash forms and databases.

Federal Motor Transport Authority

Only 12 percent of the 82 million inhabitants, or 6.8 million, are considered traffic participants in Germany. This number includes cyclists and pedestrians as well as drivers. Of the 4.3 million new violations entered onto the driver license database, about 60 percent are for people with no license. From the German perspective, the point is to protect the general public from incompetent drivers. As problems become bigger, permits to drive are withdrawn, and the local authorities are notified. Entries, or violations, are deleted from the file after the appropriate suspension or other penalty has been completed.

Because of privacy laws, no connection or linkage is allowed to driver records, but numerous reports are produced to analyze groups by gender, age, and number of offenses, along with the number of crashes obtained from the accident registry.

GIDAS

The German Indepth Accident Study (GIDAS) uses two teams to collect more detailed data on crashes, much like the National Automotive Sampling System (NASS) teams in the United States. While these teams work independently from the police, they record more detailed accident characteristics for special research use. The bias caused by the sampling is corrected by a weighting factor. These data are available for approved use in crash research.

Roadway Data of Federal Highways

In 1968, a data dictionary was developed as a guidebook for the states to develop their own systems, but instead states developed several individual systems independently. The catalog of variables was redesigned in 1986, and 10 years later the project was canceled when it was decided that it would not be possible on a national basis. Each state now designs its own database, and BASt has access to the information. These local roadway databases include core data such as number of lanes, administrative data, cross section, construction material and depths, and other roadway information.

While the Minister of Transport is responsible for roadways, the responsibility for maintaining and updating data has been delegated to the states. In 1987, the Minister of Transport commissioned a van to get data in the field on roadway characteristics. These data were offered to the states but were refused because the states had their own tools and methodologies. A national GIS database and linear referencing system has been developed, but it is expected to be costly to match the 16 state databases to this new national GIS. OKSTRA is a new data model to define the ability to exchange data with both federal and state participation.

BISStra is the federal highway information system being developed to incorporate data from the bridge management system, pavement management system, cartographic data, crash analysis in terms of prediction, trans-European road network, and other roadway-oriented data. This system contains all roadways except community roads, which are available in the state roadway databases.

Traffic Data and Traffic Statistics

In 2001, Germany had 1,106 permanent traffic counters that automatically reported hourly traffic counts for every travel lane. In addition, manual counts are conducted every 5 years for all federal road sections with a differentiation of up to six types of motor vehicles. The states get these traffic data and organize the counts, and then provide traffic information to BASt for analysis.

In 1990, 1993, and 2002, a mileage survey was conducted with motor vehicle owners. The sample size for this survey was about 120,000. The purpose of the survey was to obtain data for miles traveled, vehicle characteristics, regions visited, purpose of trip, travel time, and driver characteristics such as gender, age, and profession.

EUSka

EUSka is a crash data collection tool developed by the German Institute of Traffic Engineering, an organization similar to the Insurance Institute for Highway Safety in the United States. This Windows®-based software product allows for simplified collection of crash data for the police officer. Specific editing ensures that all data have been entered before the record can be made official. Included in the system are variables specifically required for the national database. All of the police agencies in four states now use this software. The software, support, and training are available to all police agencies throughout the country from this private institute at no charge.

Conventional street maps with different-colored pins indicating crashes, as well as time-consuming paper work and filing of accident reports, are no longer required. The user can select a crash on the digital map and immediately receive the complete accident report. Crash frequencies can be analyzed by economic damage, as well as by similarities between various crashes.

AUSTRALIA

The scanning team met with representatives or heard from the following groups in the States of Victoria and New South Wales, Australia:

- Victoria Roads Corporation (VicRoads)
- Victoria Police
- ARRB Transport Research Ltd.
- Accident Research Centre, Monash University
- Roads and Traffic Authority (RTA)
- New South Wales Police
- Insurance Division, Motor Accidents Authority
- Institute of Trauma and Injury Management
- Austroads

Team members discussed a significant number of safety systems issues with the experts in Victoria. The items summarized in this report focus on issues dealing primarily with traffic safety information systems.

Australia is a country of some 7.69 million km^2 and 20 million people. Of the more than 800,000 km of roads, 60 percent are sealed and 40 percent are unsealed. Austroads is the association of Australian and New Zealand road and traffic authorities, and functions much like AASHTO in the United States. Austroads is funded by annual member subscriptions, and has the following roles:

- Eliminating unnecessary duplication among member states
- Promoting national uniformity and harmony
- Identifying and promoting best practices

The scanning team visited two member states of Austroads—Victoria and New South Wales, Australia. Many Austroads research projects are conducted by ARRB Transport Research, which is discussed later in this section.

VICTORIA

Even though one of the smallest states, Victoria is the most densely populated, with 4.8 million or some 24 percent of Australia's population. Of that number, 3.4 million, or more than 70 percent, reside in Melbourne. Of the 155,000 km of roads, some 60 percent of arterial road travel and 25 percent of Australian road freight travel occurs in Melbourne.

Overview of Victoria Roads Corporation

VicRoads has four core businesses—road system management, traffic and road use management, road safety, and registration and licensing. These core business areas provide a clear focus for the services VicRoads provides. In the road safety area, one priority issue in the VicRoads Corporate Plan for 2002–2004 is developing new approaches to achieve the government's aim to reduce death and serious injury on Victorian roads by 20 percent between 2002 and 2007. Following this corporate plan, VicRoads adopted safer driving and vehicle policies, passed more stringent drunk driving legislation, increased the age for driving a motorcycle, and more. In addition, it provided seed funding to 13 local councils and 24 Victorian Roadsafe Community Road Safety Councils, which conducted 148 local road safety programs. VicRoads has continued to deliver the $240 million statewide blackspot program, which is the largest road safety blitz conducted by any government in Australia.

Victoria's "Safe System Approach" assumes that the road transport system is designed on the premise that accidents will happen (even with a focus on prevention) and that people should be able to withstand the external forces so collisions do not result in death or serious injury. This premise requires system designers to be responsible for building in safety, and it also requires individuals to be responsible for abiding by the rules. Crash and other data are required to support this safe systems approach. These data are used to identify and understand road safety issues, develop policy and strategy, develop programs and projects, measure performance and benchmarking, evaluate outcomes, and conduct safety research and development.

The data requirements identified by VicRoads to support safety programs include the following:

- Crashes (location details, prevailing conditions, crash types, users involved, etc.)
- Speed (speed limits, operating speeds, and trends)
- Speed enforcement (when, where, how, how much, infringement numbers, and trends)
- Traffic volumes and composition (current and future demands)
- Alcohol and drugs (involvement in fatalities and other crashes, enforcement and infringement levels)
- Road and roadside features and conditions (compliance with standards, road surface conditions, hazards, and level of risk)
- Licensing (who, how many, age profile, demerit details, and involvement of unlicensed/disqualified drivers in crashes)
- Vehicle registration (how many, vehicles types, and roadworthiness)

To meet safety goals for reduced injuries and fatalities, it has become even more important for VicRoads to identify specific and detailed data requirements and conduct analyses at the site-specific level with better location information. Overall, the accuracy of the data has become more critical. Recent legislation indicates a possible move toward more litigation on accidents, but it is unclear how this might affect data requirements and analyses.

Licensing and Registration

Victoria has 3.6 million license holders and 3.8 million registered vehicles, and it processed 13 million registration and licensing transactions from 2001 to 2002. During those years, VicRoads handled almost 2 million transactions via the Internet and the online Vehicle Securities Register (VSR). More than 77 percent of these customers were served within 10 minutes. The services to support these drivers and vehicles were measured independently by national performance indicators and determined to be the most efficient in the country. A new driver licensing system was introduced in February 2002 that includes the following benefits:

- Improved ability to provide electronic service delivery
- New business initiatives, such as one-stop point of sale
- Greater flexibility to analyze driver licensing data for road safety research
- Improved quality of data
- Improved capability to prevent the issuance of fraudulent duplicate licenses

Crash Data Collection

Victoria's overall road safety structure includes three major partners in road safety:

- VicRoads (registration and licensing, road safety coordination and evaluation, and road network management)
- Victoria Police (enforcement, collision investigation, and reporting and prosecution)
- Transport Accident Commission (third-party insurance, and investment in road safety countermeasures, public awareness, and advertising)

Also involved in the road safety process are the Department of Justice; Department of Human Services; Department of Education, Employment, and Training; local government authorities; and community road safety councils.

About 38,000 crashes per year are reported to the police on a standardized accident report form. Crash reports are turned in within 10 days, though crashes involving fatalities are reported daily. The data collected from the collision reports are used to do the following:

- Identify and validate safety camera sites.

- Identify blackspot intersections and locations.
- Identify areas for enforcement and local road safety initiatives.
- Assist with the deployment of Booze Buses.
- Identify locations for road environment improvements.
- Report under the Victoria Police Business Plan.
- Measure road trauma outcomes each year.
- Update the Victoria Police Intranet and Internet Web pages.
- Map locations and trends.
- Deploy resources.
- Provide information for the Victoria Police Media Unit.

In Victoria, police investigate collisions to fulfill three functions: (1) determine a breach of law, (2) determine compliance of the vehicle and road with standards, and (3) to provide statistical information. There are five levels of collision investigation:

1. Reporting—basic data collection and identification of vehicles and persons
2. At-scene investigation—examination and recording of physical evidence
3. Technical preparation—delayed data collection by those with special training
4. Professional reconstruction—investigation requiring engineering and scientific skills
5. Cause analysis—determination of the cause of the collision

A minor crash is reported, fault is established, and a penalty notice may be issued if the law is breached. A moderately serious crash is reported with a scene investigation, and a brief is prepared or a penalty notice is issued. A major crash is reported, the scene is investigated, a technical investigation and reconstruction are conducted, and the result is preparation of a summary and a criminal or coroner's brief of evidence.

Australia's National Crash Indepth Study

In addition to routine crash reporting, a sample of Victoria's crashes is included in Australia's National Crash Indepth Study (ANCIS), which is similar to the NASS program in the United States. These special crash investigations cover the following:

- Focus on vehicle crash performance.
- Obtain cases for study from participating hospitals.
- Include involved vehicles less than 10 years old.
- Conduct interviews.

- Examine medical records.
- Inspect the vehicle and the crash site.
- Involve vehicle manufacturers.

Data Systems Management

The Road Information Systems group at VicRoads supports the road assets, traffic, and crash data systems. The data collection and data support activities are conducted under contract to the road safety group at VicRoads. Crashes are sent to VicRoads in an electronic format, and the staff performs extensive quality control on these data. The crash system uses GIS and has been developed for Intranet and Internet access (www.vicroads.vic.gov.au) by all authorized users. Figure 13 shows several examples from this system.

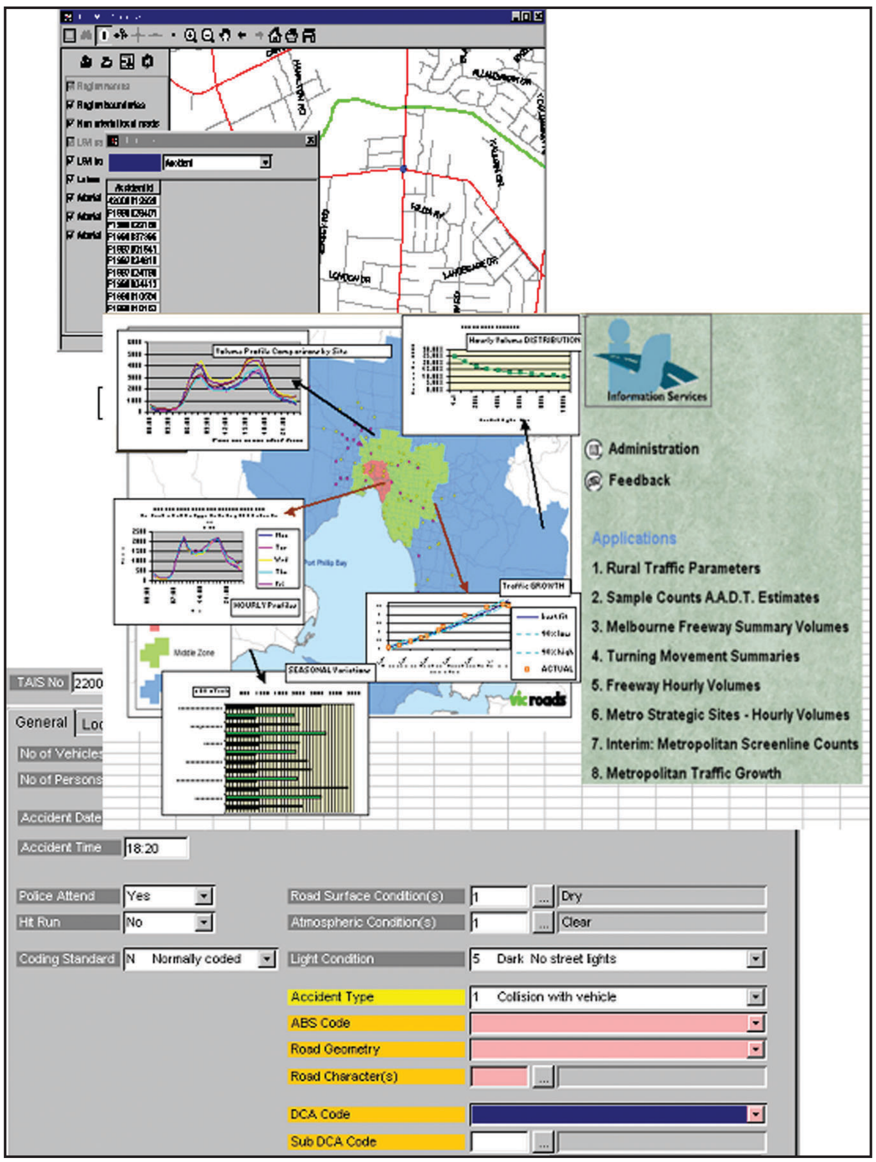


Figure 13. Road Information System examples.

NEW SOUTH WALES

The past 25 years have seen significant improvements in road safety in New South Wales. The road fatality toll has been cut by more than 60 percent while estimated motor vehicle travel has doubled. The fatality rate is now similar to levels in the late 1940s, even though figure 14 shows that the population has doubled since that time. Six times as many licenses have been issued, and eight times as many vehicles are on the roads.

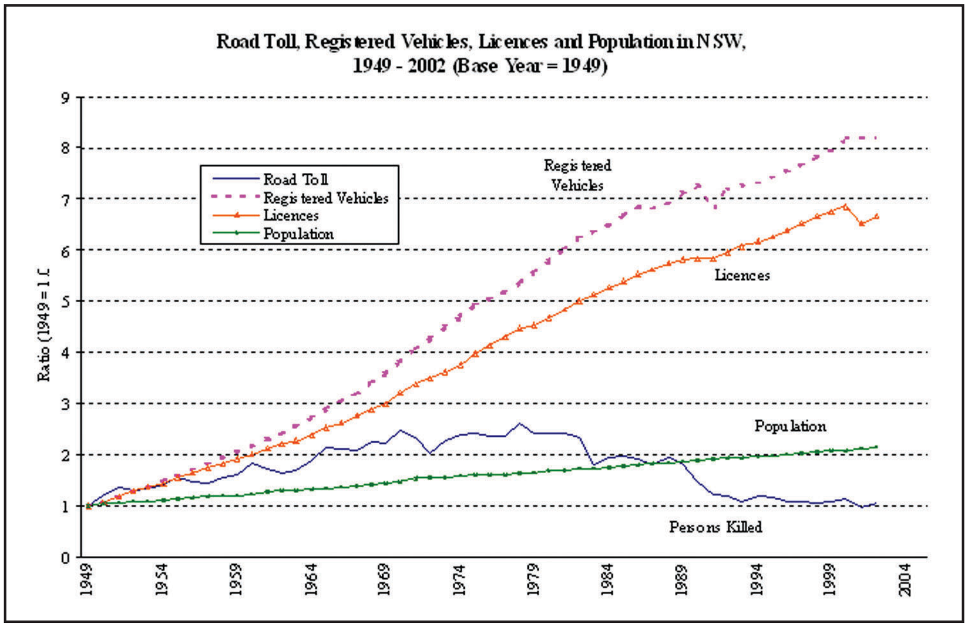


Figure 14. Road toll for New South Wales from 1949 to 2002.

Road traffic accidents totaling 51,814 were recorded in New South Wales during 2001, with 524 persons killed and 29,913 injured. The Roads and Traffic Authority (RTA) estimates the economic cost to the community of these crashes at $2.58 billion.

Overview of the Roads and Traffic Authority

RTA is the New South Wales government agency responsible for (1) testing and licensing drivers and registering and inspecting vehicles, (2) managing the road network to achieve consistent travel times, (3) improving road safety, and (4) providing road capacity and maintenance solutions.

As stated in *Towards 2010,* the New South Wales government is committed to ensuring the following:

- People do all they can to ensure that they and others are not needlessly exposed to the risk of death and injury on the roads.
- Lives are not endangered because of excessive speed.

- Offenders who break road laws and endanger the lives of others will be appropriately penalized.
- The safety of vehicles on New South Wales roads is equal to the best in the world.

These goals reflect the partnership between the RTA and the community and the importance of both in ensuring road safety.

Crash Data Collection

Crashes involving vehicles and people (on and off roads) are reported to the New South Wales police and are categorized as either major or minor. Major crashes involve injuries, deaths, intoxication, towed vehicles, and cases in which drivers left the scene or failed to exchange particulars. Minor crashes are all other crashes and are reported at the police station or by telephone to the Police Assistance Line (PAL). In the field, the officer writes particulars about the crash into an official notebook.

Information the officer gathered is then captured in a mainframe system called COPS (Computerized Operational Policing System). This system provides a single access point by storing all policing information in one database. COPS can be accessed either at the police station or via mobile data terminals in police vehicles. Officers enter the majority of the information into COPS, although unsworn staff members perform some data entry.

COPS has an interface with the RTA and National Vehicles of Interest systems to integrate vehicle and personal details, and location coordinates can be entered if a GPS is available to the officer. The officer's narrative summary of the crash is also entered and becomes available to both internal and external customers. Data from COPS is available to both internal and external agencies, such as the RTA and the Bureau of Crime Statistics.

Crash Data Management

The purpose of COPS is to provide fast and easy access to comprehensive and reliable information about motor vehicle crashes. The main benefit of COPS is the ability to share information. COPS is one of many systems that reside in a data warehouse environment for easy access. This concept is illustrated in figure 15. Crash data can also be exported and downloaded from COPS into various other software packages. The Traffic Research and Intelligence Unit (TRIU) within the RTA downloads data from COPS and uploads that data into Microsoft Access databases for analysis and reporting.

TRIU staff is responsible for developing and maintaining the Traffic Services Branch Intranet site available to all within the New South Wales Police. Fatal information is updated daily for reporting to the Police Executive and Media Unit, and other information is updated on a monthly basis. Statewide traffic operation data are available on a daily basis. Information is available from the data warehouse in graphic and table format for police and intelligence officers throughout the state, and they can drill down to their local area command (LAC) level by selecting the region or LAC, as shown in figure 16.

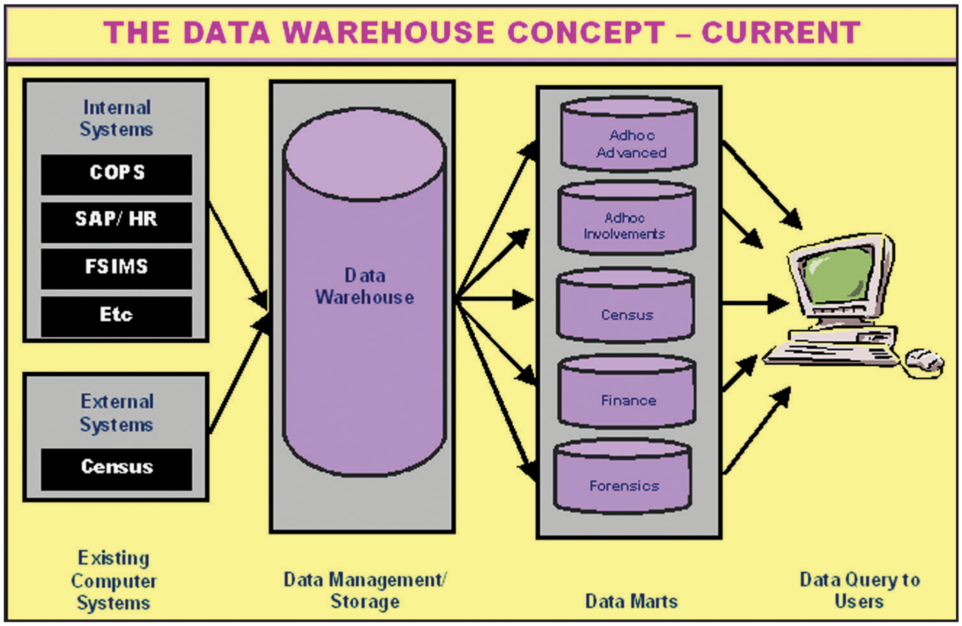


Figure 15. The enterprise data warehouse concept.

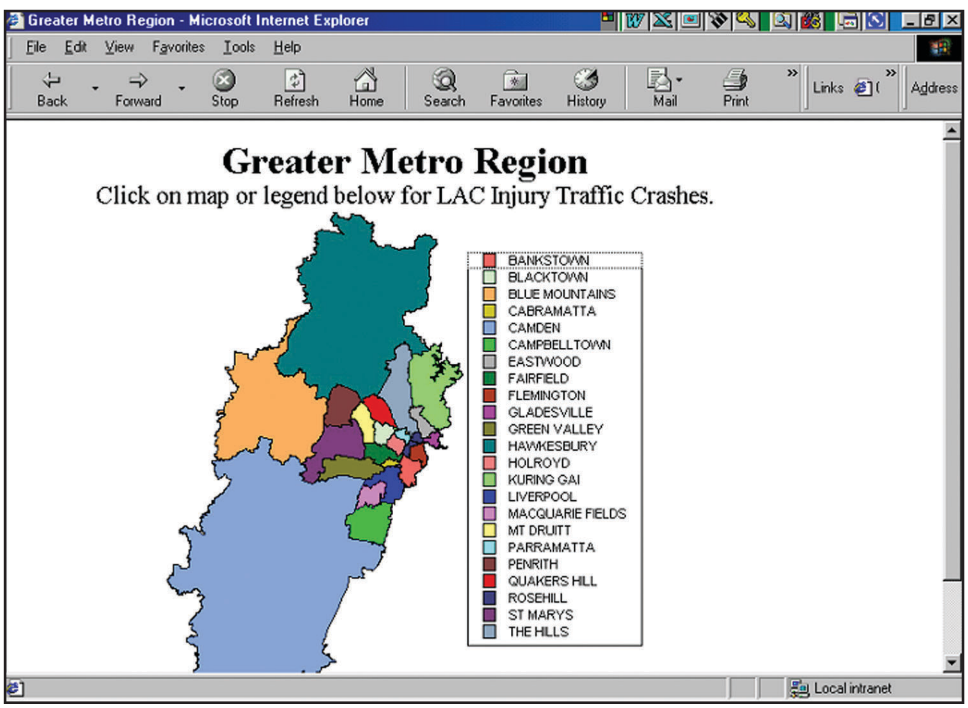


Figure 16. Example of access to the data warehouse.

The Traffic Accident Database System (TADS) is a separate accident database from COPS, and data are entered again into this system that provides data for the RTA. Extensive quality control is performed on these crash reports, and only 70 percent of the crashes entered into COPS meet the threshold for entry into TADS. The threshold for TADS is all crashes in which a person was killed or injured or at least one motor vehicle was towed away. Other data are collected for entry into TADS from the Western Sydney Area Health Service's Division of Analytical Laboratories (DAL). Data from DAL include hospital blood screening tests of motor vehicle casualties and blood alcohol content (BAC) data from people who have died from motor vehicle accidents.

Regional Accident Blackspot Programs

The Crash Analysis Unit developed and maintains a suite of road traffic accident databases. These databases were introduced in Sydney to consolidate information from several stand-alone and networked accident, GIS, and fatal accident databases and applications to form a single database suite for use by the unit and other Sydney Client Services staff.

The Crash Analysis Unit conducts systematic accident investigation studies in Sydney to identify hazardous locations that could be treated under the Regional Accident Blackspot programs. These studies of the Sydney road network are also fundamental in identifying potential locations for the RTA's Fixed Digital Speed Camera Program and in Mass Action investigations covering issues such as right turn filter and red light running collisions. The unit is also responsible for managing, analyzing, and maintaining Sydney road safety data.

Indepth Crash Investigation

The crash investigation unit of the New South Wales Police was formed in 1982 to provide a specialist unit to investigate fatal and serious injury collisions that may result in criminal charges. The metropolitan area has an authorized strength of 32 members split into three teams. The country units comprise another 20 officers. The teams attend crashes under the following conditions:

- Death has occurred or is likely.
- Serious injury has occurred and criminal charges are likely.
- Serious injury or death has occurred and the responsible party cannot be identified or statements are conflicting.
- The crash involved failure to stop and people have been killed or seriously injured.
- Death or actual injury occurred and a police service vehicle or onduty service member is involved.
- It is a major incident of an unusual nature.

The responsibility of the teams is to perform a crash investigation that includes the following:

· Attending the scene, ensuring the area is safe and preserved

· Examining the scene

· Interpreting the evidence

· Identifying the evidence

· Recording the evidence

· Testing theories on the crash cause

· Observing the surrounding area

· Noting the engineering makeup of the road and area

The teams often test new technologies for performing their onsite data collection tasks. Along with the U.S. Marine Corps, the New South Wales Police Crash Investigation Unit is evaluating the use of the DART drag sled to measure the friction of the road surface. This equipment is shown in figure 17. One condition of testing new technologies for data collection is to evaluate the balance between accuracy and speed in an effort to improve both procedures and response time.

Traffic Asset Inventory Management System

The Traffic Asset Inventory Management System (TAIMS) stores all traffic assets on state and national roads in New South Wales, such as longitudinal line markings, raised pavement markers, transverse and other markings, minor and major signs, safety barriers, guideposts, location of traffic signals, and more. A computer screen illustrated in figure 18 shows the traffic assets on the AssetMap application.

Figure 17. DART drag sled.

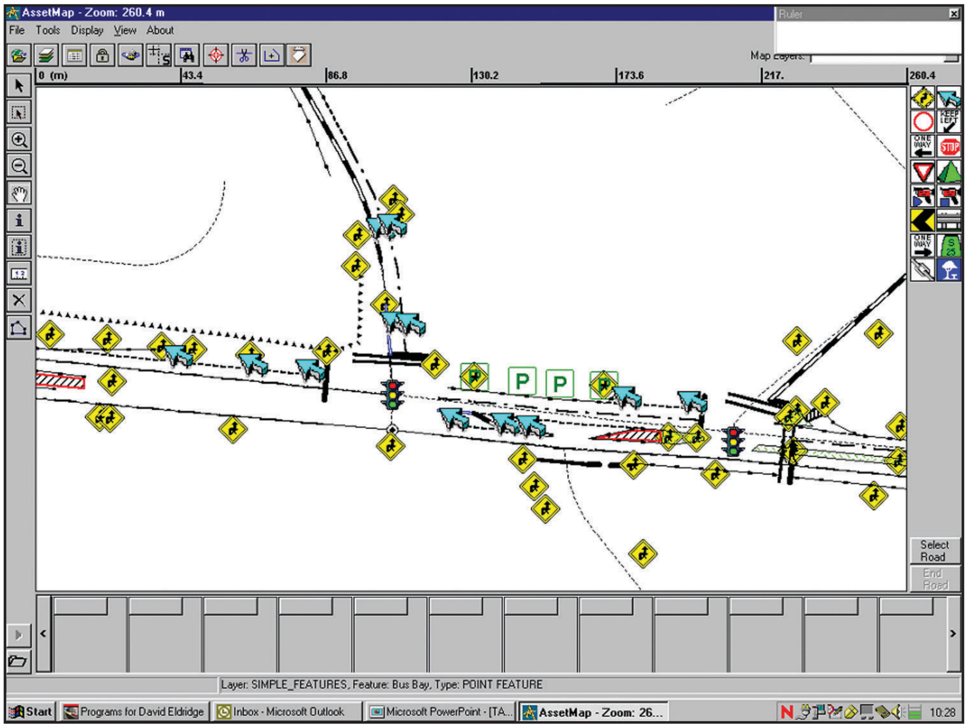


Figure 18. Traffic assets on the AssetMap application.

Transport Management Center

The transport management center (TMC) in Melbourne covers the motorways, highways, arterial roads, local roads, central business districts, major transport modes, and major event venues. TMC objectives include the following:

- Achieve the best possible traffic flow every minute of every day.
- Improve the consistency of journey times.
- Manage traffic incidents and achieve the best possible clearance times.
- Provide information about real-time traffic and road conditions to road users.
- Maintain a balance between all users of the road network.
- Assist road users on the road.

TMC is in operation 24 hours a day, 7 days a week. In 2002, the TMC operations room managed more than 20,000 incidents and received 250,000 phone calls to its public and stakeholder lines. In addition to phone call services, TMC relays traveler information via the Internet, radio, variable message signs, and onboard vehicle information systems. Tools used by TMC for traffic management include the following:

- RTA traffic manager vehicles
- Tow trucks

- Traffic emergency vehicles
- Closed-circuit television
- Variable message signs
- Variable speed limit signs
- Electronic lane-changing systems
- Vehicle detectors in the roadway

TMC uses any combination of these traffic management tools, as well as traveler information, to maintain road network mobility and safety. While not all of the continuous data collected from these tools are now used, it would be possible to do so from saved archives.

Traffic Data

New South Wales is divided into six regions, and sample surveys are conducted in two regions per year to count axle pairs, vehicle classification, and traffic volumes. There are 490 permanent traffic count sites, 1,500 sample axle pair and sample classification sites, and 33 weigh-in-motion (WIM) sites. New technologies for traffic data collection are gradually being introduced to do the following:

- Improve accuracy, particularly in an urban context.
- Obtain data completeness, including remote early identification of equipment malfunction.
- Provide flexibility in testing algorithms for separating vehicles in a traffic stream.
- Introduce error-detecting software.
- Facilitate dial-up of real-time data.
- Facilitate remote control.
- Enable GPS, particularly in urban areas where submeter accuracy is needed to locate direction.
- Improve accuracy and data completeness.
- Facilitate more intelligent editing.
- Improve ease of operation and maintenance.
- Cross talk with other field systems, such as the Safe-T-Cam.

In addition to the traffic surveys, the New South Wales Department of Transport (via the Australian Bureau of Statistics) has undertaken household travel surveys on an ongoing basis since 1997. Data are collected by door-to-door interviews using a questionnaire format to record trip information. The average response rate is about 65 percent. Information on names and genders is treated as confidential, and no age information is collected. Using these surveys, the DOT compiles statistics on motor vehicle use, including trip patterns, summaries of which are accessible via the Internet. In addition, limited sample size telephone surveys on trip patterns and safety issues are conducted.

Institute of Trauma and Injury Management

The Trauma Minimum Data Set was begun in 2002 after the establishment of the New South Wales Institute of Trauma and Injury Management and is being used in trauma centers throughout the Sydney metropolitan area. The first year of data collection confirmed that road trauma is still the major cause of serious injury. Extensive data are now available for patients who had an injury severity score greater than 15, which is consistent across the trauma services in Sydney. Since this project has just begun, it is not clear yet how these data will be linked or used by those working in road safety.

ARRB Road Safety Research

ARRB Transport Research had conducted hundreds of projects for Austroads that have resulted in new methodologies, strategies, software, and hardware solutions to improve road safety and safety data collection.

Road Safety Risk Manager

To help members of Austroads manage road-based crash risk factors, ARRB Transport Research developed a computer-based “expert” system called the Road Safety Risk Manager (RSRM). This system, shown in figure 19, is designed to be used as a tool for programming road safety improvements and is based on relationships between road elements and crash risk that have been identified or developed from available literature. Application of RSRM is expected to (1) reduce the risk of road crashes and road trauma, (2) reduce the risk of crashes resulting in fatalities or serious injuries, (3) provide economic benefits to the community as a result of fewer and less severe crashes, and (4) reduce legal action against road authorities that may result from crashes.

Potential uses for RSRM include the following:

- Assess and prioritize road safety audit recommendations.
- Prioritize a mass action program of works, such as installation of guardrails, line markings, and turn lanes.
- Assess and prioritize routine, safety-related maintenance and inspections.
- Assess and prioritize safety projects as part of a wider blackspot program.
- Track the status of any safety issue and record any action taken to close the loop.

Figure 19. Road Safety Risk Manager software.

Road Safety Advisory Audit System

The Road Safety Advisory Audit System provides a mechanism to document the process and results of road safety audits. Figure 20 shows an example of documenting the location for an audit.

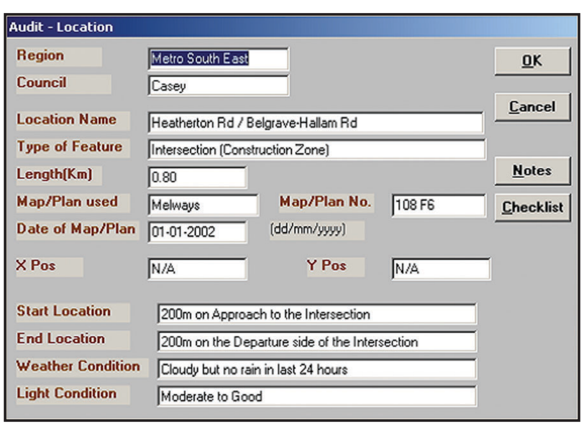


Figure 20. Road Safety Advisory Audit software.

Figure 21. Remote data collection.

XLIMITS

XLIMITS is an advisory speed limit expert system into which road environment, functions, hazards, traffic signals, modal activity, crash records, and numerous other factors are entered. The purpose of this software is to establish a credible speed limit for a roadway that can be consistently applied and enforced by the police.

Weigh-in-Motion

Road authorities need data to assist them in the following tasks:

- Predicting the future state of the network
- Protecting roads and bridges from damage by overloaded trucks
- Designing roads and bridges (bearing capacity)
- Auditing the transport industry for safe and complying operation
- Scheduling pavement management maintenance

- Planning based on information on traffic volume and type
- Concentrating enforcement activity, such as on the time of day or vehicle
- Identifying overloaded vehicles for enforcement action

Weigh-in-motion (WIM) technology provides traffic volumes, speeds, axle loads, vehicle types, and headway (the distance between vehicles) to assist in these activities. WIM sites are remotely connected to the office via a landline or a mobile phone network, as shown in figure 21. The advantages of remote connection include the following:

- Data collected transferred to the office
- Equipment operational checks
- Remote software upgrades
- Real-time vehicle information transmitted to a mobile vehicle for interception and subsequent enforcement activities

One method used to collect measurements, such as dynamic axle mass of a moving vehicle or traffic volume and mix, without disrupting the traffic flow is to place sensors under a culvert, as illustrated in figure 22.

For freeway applications, ARRB has developed a WIM system that uses in-road sensors that provide vehicle mass, volume, speed, and classification data. These sensors are installed in slots cut into the road surface of asphalt or concrete. The slots are grouted with epoxy and silica sand to closely match the road surface.

Figure 22. WIM sensors in situ.

Profilers and Roughometer

A walking profiler, shown in figure 23, measures surface profile and grade, simulates straightedge measurements, and calculates the International Roughness Index (IRI) and the California Profilograph Index (CPI). This device samples the survey surface at a controlled walking pace. The Footworks software package provides the profile and IRI. An advanced version of the software also provides CPI and straightedge measurements.

Figure 23. Walking profiler.

A portable laser profiler system, shown in figure 24, collects road surface condition data while traveling at highway speeds. This profiler comes with an onboard computer, conditioning electronics, odometer system, and software for data acquisition and analysis. This portable profiler can be mounted on a range of vehicles, and measurement is independent of vehicle suspension and tire characteristics. Data can be reported as longitudinal height profile, IRI, Rut Index, and optional pavement surface macro texture.

Figure 24. Portable laser profiler.

While profilers can be used on sealed roads, a high percentage of roadways in New South Wales are unsealed. For those roads, ARRB developed the Roughometer. Shown in figure 25, it is a convenient measurement device that can provide an objective assessment of ride quality or road roughness for unsealed roads. The Roughometer can be fitted to the vehicle with a sensor attached to the rear axle, and the portable control device can be plugged in when a survey begins.

Figure 25. Roughmeter.

Digital Imaging System

An example of digital video imaging mounted on the top of a vehicle is shown in figure 26. This technology is used to identify and measure pavement distress, measure and classify road surface markings, locate and classify roadside assets, assess and classify roadside conditions, and log kilometer posts for road alignment. This system consists of vehicle-mounted video cameras that capture images that can be displayed in real time. The captured images can be stored on a variety of media for future use. The digital video images can be logged at highway speeds, and a differential GPS option is available to locate the images more accurately.

Figure 26. Digital imaging technology.

Gipsi-Trac

The Gipsi-Trac (Global Inertial Positioning System Integration Tracking Route Alignment and Crossfall) is a vehicle-mounted data acquisition system that uses GPS and sensors to record continuous three-dimensional highway maps and road geometry information. The system can provide latitude, longitude, and height at 10-meter intervals.

A laptop computer is used to operate this system and to process and store the survey data. This system is easily installed in most standard vehicles and operates in all locations. An important feature is the ability to fully process and verify the survey data while the survey vehicle is still onsite. During operation of the Gipsi-Trac, the vehicle data acquisition screen, shown in figure 27, provides field operators with immediate survey-quality feedback.

Following are some of the road questions that can be answered with Gipsi-Trac survey data:

- Does the road conform to design specifications?
- What do conditions suggest about appropriate estimated design speed signage?

- What is the geometric analysis for a road accident scene?
- What are the line-of-sight distances?
- What are travel times?
- Where will rainfall accumulate on the road (ponding)?
- Where is the “goat track” that over the years has turned into a minor road?

MUARC Research Activities

The Monash University Accident Research Center (MUARC) is Australia’s largest multidisciplinary research center specializing in the study of injury and injury prevention. Its research and evaluation studies often depend on accurate, comprehensive, and timely databases. For this reason, MUARC has become involved in creating, maintaining, enhancing, and analyzing data from multiple sources, including (1) coroners, (2) motor vehicle crash reports, (3) workers’ compensation systems, (4) hospital inpatient and emergency department surveillance systems, (5) cost databases, and (6) population data.

While the desired level of detail is not always available, MUARC continually works with data initiators to improve the specificity and quality of data. Linkage of the various databases is usually a necessity for the research conducted by MUARC staff.

In addition to using existing data sources, MUARC collects data for specific studies, such as multidisciplinary reconstructions of crashes. Among numerous other studies, MUARC established the cost-benefit of accident blackspot investments. By determining the best kinds of treatments, MUARC identified more effective programs for implementation.

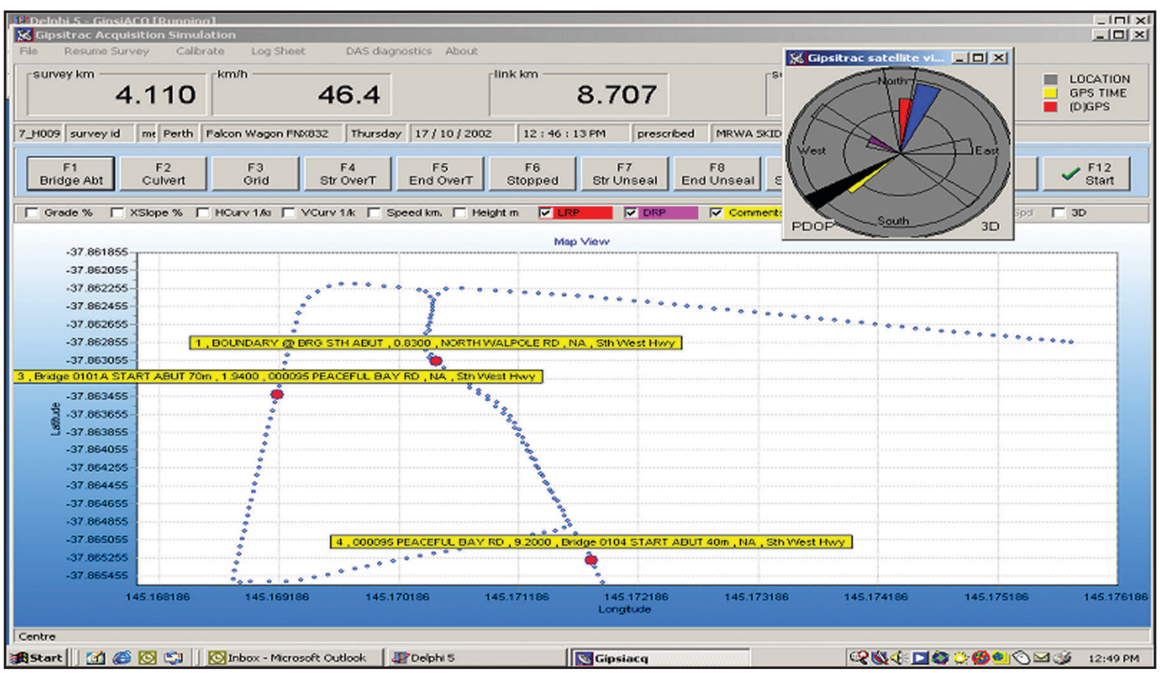


Figure 27. Gipsi-Trac data acquisition screen.

Chapter Three
Safety Data Themes

While discussing the topic of safety data with experts in other countries, the scanning team did not, for the most part, identify better systems and technologies than those available throughout the United States. The scanning team did, however, identify several themes that supported a coordinated or strategic approach to collecting, managing, and using safety data in each of the countries. The issues the scanning team considered most important in the context of safety data can be grouped within the three major headings of strategy, efficiency, and utility.

Themes included as strategic issues focus on considering safety a core business function of government and placing emphasis on making resources available for using safety data for strategic decisionmaking. Themes included as efficiency issues focus on ensuring that the right safety data are collected simply, accurately, and at a reasonable cost. Themes included in utility issues relate to the ability to use data for research and analysis, including the analytical tools available to do so.

STRATEGY

Strategic issues reflect management initiatives, laws affecting data ownership, funding of the systems, and planning for safety data improvements. Obtaining good safety data is often a result of relying on the data for decisionmaking and leadership support rather than any specific technology applied. Where this works well, the organizational structure and commitment of resources applied to safety research is considered the way of doing business. It is inclusive and shows evidence of broad-based, active participation among agencies and jurisdictions. Most important is the commitment to data-driven decisionmaking and extensive use of performance measures and metrics for the safety data themselves. The scanning team identified the following major themes as strategic issues:

- Overarching leadership
- Data-driven strategic approach
- Organizational framework
- Partnerships (public-private and interagency)
- Marketing

Within the major strategic themes, the scanning team considered the following the most important issues:

Goals and accountability for safety start at the top. A strategic safety focus takes top leadership involvement, participation, and monitoring, but it does not include mandates to local jurisdictions. Clear measures are set from a national level and communicated consistently to the states through education and training. States can then develop supporting goals and accountability measures. Local agencies participated in particular safety programs because they saw the benefits. The new policy studies office at SWOV in the Netherlands highlights the importance of data to top officials. The countries visited are just beginning to develop advanced data systems. The majority of their safety accomplishments have been achieved without robust and linkable safety data systems.

The performance of the system is monitored. Resources are strategically allocated toward prevention of safety problems (proactive) instead of corrective actions, with the goal of achieving an appropriate balance. The safety data systems are supported by sufficient resources and continuously improved to support the kinds of decisions required. For example, as the safety programs have become more mature, it has become increasingly important to consider areas that may have potential for improvement before becoming a blackspot. Safety data are used in risk analysis and risk measurement, and safety improvements are approached in a strategic manner, with performance measures of the improvements established and tracked. New implementation strategies are measured to be sure the system improves as planned. Ultimately, safety data are used to measure how reliable mitigation measures are and whether the prediction matches the actual findings.

A strong safety management framework exists in the public agencies. Safety is defined as a core business of government. Managers meet frequently with their sole mission to improve safety. In addition to upper-level leadership and management, agencies have a dedicated safety staff. The push is from the top and involves the staff as well as academic resources. Safety is definitely established as a performance measure. Leaders also have a clear recognition of who owns the data and what the data mean.

Driver safety initiatives have high-level support. Drivers are viewed as lifelong customers. Driver-oriented safety initiatives are supported throughout the countries because these initiatives are supported by safety data that have been communicated to citizens. This education and communication is in the form of daily announcements focusing on fatalities and general statistics, goal setting, openness of public access to data, and linking of roadway safety and driver licensing programs.

The safety business model includes private and public participation. Safety programs, as well as safety data collection and use, are coordinated among agencies in all jurisdictions, as well as with private organizations. The team approach is used to improve safety and safety data accuracy.

EFFICIENCY

In the area of efficiency are items that relate to overall return on investment in records, standards, data integration, and technology. Data quality is an efficiency issue in that better data ultimately saves money by supporting better decisions and is cheaper to collect and maintain than a system that suffers from inaccuracy and omissions. The scanning team identified the following major efficiency themes:

- Technology
- Simplified data collection

- Data linkages and sharing
- Data quality, consistency, and system uniformity
- Training

Within the major efficiency themes, the scanning team considered the following the most important issues:

Data linkage and integration limit the cost of data collection. If linkage is improved, not as much data must be collected, and it can be collected and recorded once for database use. Data linkage and integration strategies are used to limit the amount of data collection and input needed and eliminate data inconsistencies.

Safety data partnerships allow sharing of information. An example of multiple jurisdictions working cooperatively to improve safety data is "data-to-data partnerships" that involve sharing GIS network data with local jurisdictions willing to provide updates to the network to improve data coverage. These partnerships result in better and more current data for both the national and local jurisdictions to use for safety data planning. In addition, Web-based, password-protected uploads of data can be made to a centralized database by multiple agencies and jurisdictions.

Common definitions result in more consistent data. Common data definitions are shared among stakeholders to ensure data consistency and interoperability among various jurisdictions. This data consistency is important for benchmarking both safety data systems and safety programs.

Numerous methods are used to simplify field data collection. Law enforcement officers generally have other priorities besides data collection. To ensure their continued cooperation, an effort is made to streamline and simplify field data collection. The process of obtaining and processing data in the field is kept simple, and those entering data are included in the planning process. The basic questions are "who uses the data?" and "for what purpose?" Specific cost-benefit analyses are conducted before data elements are added for field collection. Sampling methods and estimation (getting data from market surveys, for example) are used to reduce onsite data collection. Even with strong privacy requirements, the Netherlands collects driver behavior and safety information from citizens using direct mail surveys. Incentives for survey completion (such as gift cards) result in return rates as high as 70 percent. In fact, safety goals in the Netherlands are established from crash estimates from numerous samples instead of reported crash data. In many cases, instead of creating a huge database, numerous smaller databases are connected for analysis using GIS location coding.

Training and data collection tools are made widely available. The German Institute for Traffic Engineering is an example of a public-private partnership. The institute provides extensive training on data collection and free crash data collection software to law enforcement officers. Also in Germany, the government has legislated preset definitions of data allowed on event data recorders. This way, the government could specify what safety items must be on the recorders from the manufacturers and only then could manufacturers add data they wished to collect.

New ways are identified to use existing technologies for data collection. Efforts to collect new data from existing methods and technologies continue. This includes using data extrapolation methods (statistical methods) to minimize additional data collection. It also includes using existing GIS, which traditionally would be used only for reporting and analysis, to help to identify accurate locations when entering crash data. In the case of roadway data collection, traffic loop data can be used to capture tailgating information for both traffic education and to focus police on potential problem areas. Roadway data can be collected using cameras that monitor speed or heavy vehicles, as well as traffic management centers and equipment, such as the Gipsi-Trac vans and asset location software used in Australia.

UTILITY

Utility issues include those that relate to access, marketing, research, and specific analyses in the driver, vehicle, and roadway areas, including analytical tools to support cost-benefit comparisons and safety analyses. The following major themes are included as utility issues:

- Universal access to data
- Analytical tools to support safety analysis and cost-benefit comparisons
- Allocation of resources and funding
- Support for marketing of safety issues

Within the major utility themes, the scanning team considered the following the most important issues:

Safety data are open and accessible. In the Netherlands, officials are open about safety data that do not include personal information and distribute it widely. German officials were not as open to the public, but they shared their data throughout the government. While some data are used internally only because of privacy policies, most statistical crash data collected are openly available and shared. In some cases, these data are readily accessible via Web applications on the Internet. In support of an open access policy for safety information, a service center concept is deployed in the Netherlands to provide a call-in help desk for local jurisdictions and others to obtain statistical crash data and analyses.

Safety data support communication and marketing of safety programs. Tactics such as publications, billboards, and other public relations and marketing components are used to encourage crash prevention, but a greater emphasis is placed on communicating safety issues and costs to society. Marketing training emphasizes that buy-in can be achieved by showing numbers and data in pictures and keeping them simple. The purpose of this effort is to train people to avoid crashes. Attitudes are a major focus of marketing efforts. The goal is to change people from considering driving a right to recognizing it is a privilege that comes with the responsibility to stay safe. Blackspot programs can be effective marketing tools as well, if they involve the public, the actual users of the streets.

Drivers are included as an important component of safety programs. Driver licensing sanctions (such as points and demerits) are severe for failure to obey travel laws and regulations, but the tendency is to forgive bad driver behavior over time. Driver histories are cleansed after the sanction is served. The philosophy is that sanctions lead to rehabilitation, and initial punishment is enough. While personal driver information is not linked with other data, driver history information is shared for law enforcement and regulatory purposes countrywide, and a national database is available to determine driver fitness. Privacy of personal information is coveted and highly protected in Europe. As a rule, this requirement can hamper research and an accurate depiction of a driver's record and driving history. Nevertheless, driver data are used to help identify risk-taking behaviors and other issues that can be addressed in safety programs.

SUMMARY

The scanning team identified numerous safety data issues in the host countries in the areas of strategy, efficiency, and utility. The team selected the items listed below as the most important themes to be used in developing recommendations and a strategy for implementation:

Strategy

- Top-level State and national support needs to be demonstrated for traffic safety information systems. A national set of measures should be created and followed with clear communication to the States. State leadership, in turn, should work to develop goals and ways to assess completion of those goals.
- Top-level meetings of stakeholder agencies in the public sector should have a singular focus on safety. Safety should be clearly defined as a core business, and performance measures should be established by which safety improvement can be assessed.

Efficiency

- A main goal is to streamline and simplify data collection, especially for the officer in the field. This requires a review of data requirements and an eye toward quality assurance and collecting only the information needed.
- Current technology can be used more efficiently to simplify data collection (through linkage rather than field data collection) and improve overall data quality.
- New technology can be used where it will increase efficiency and/or improve data quality by also decreasing the amount of data collected onsite and through use of edit checks or other quality assurance methods.

Utility

- Since safety data use is a fundamental precursor to improving data quality, marketing traffic safety information is a crucial activity. Through marketing, raising awareness of the issues and uses of data will, in turn, support data improvements.

- Analytical tools that help users get the most of the data and support specific job functions such as performance monitoring, evaluation, and countermeasure selection are crucial. Increasing access to data and the availability of user-friendly analytical tools will help ensure data quality improvements.

Chapter Four
Recommendations and Implementation Strategies

The true success of an international scanning study is bringing ideas back to the United States and creating the change required to put better systems and technologies in place. AASHTO's Strategic Highway Safety Plan addresses six major areas (drivers, special users, vehicles, highways, emergency medical services, and management), and sets the stage for moving forward. Under the strategic area of management, the plan includes the following goals:

- Goal 21—Improving information and decision support systems
- Goal 22—Creating more effective processes and safety management systems

The scanning team believes that the goals are a start for getting better traffic safety information systems in the United States, but both goals need to be revised. For example, Goal 21 contains five recommended strategies developed several years ago that need to be revised in the context of current safety programs and the team's ideas for putting more effective systems in place. The scanning team also believes that the seven key themes in the categories of strategy, efficiency, and utility highlighted in Chapter Three should be considered by the States as they begin the challenging process of improving their traffic safety information systems.

The scanning team proposes to advance these themes in a four-step process through an umbrella strategic project with the long-range goal of developing a more comprehensive approach to Goal 21 of AASHTO's Strategic Highway Safety Plan:

1. Prepare a white paper that describes in greater detail the guiding principles and proposed implementation strategies behind each of the seven themes outlined in Chapter Three.
2. Conduct a focus group meeting to validate the white paper, develop additional details as necessary, and develop a framework for a National Safety Data Forum with appropriate sponsorship from various highway safety organizations.
3. Conduct National Safety Data Forum.
4. Prepare final implementation documents.

After the national forum, the scanning team will work with the sponsors to summarize final recommendations and update Goal 21, as well as to obtain AASHTO acceptance of the implementation strategies to carry the process to conclusion.

A number of other implementation strategies are being explored to support the umbrella strategic project. These strategies are outlined below:

- Conduct a scan within the United States to determine best practices for collecting, processing, storing, and sharing data.

- Develop a marketing plan for traffic safety information that will increase the awareness of the public and political entities of the importance of safety data.
- Enhance and simplify data collection by law enforcement officers by increasing the automation of data (through such methods as electronic collection and laptop computer use), as well as by ensuring that data collected are both necessary and cannot be obtained by means other than the officer in the field.
- Expand the use of existing technology to improve and expand databases and support electronic data collection of all types (such as crash, roadway features, traffic, imagery, driver, and medical data). Provide technologies and methodologies to reduce and share costs of developing and maintaining systems.
- Develop an implementation approach for the widespread application of safety analysis tools.
- Seek and evaluate new technologies to improve and expand the collection and management of data.
- Conduct a comprehensive review of safety-related data element needs (including the benefits and costs of each element collected and stored) and seek methods to remove redundancies and inefficiencies.

These implementation strategies, as well as supplemental implementation recommendations and strategies, are presented in more detail in a separate *Scan Technology Implementation Plan* document. The scanning team will share its findings and promote these recommendations to constituencies through distribution of this report, published articles, and presentations at meetings and conferences.

References

INTERNET URLS

Community Road Accident Database (CARE)
http://www.europa.eu.int/comm/transport/home/care/index_en.htm

International Road Traffic and Accident Database
www.bast.de/irtad

International Road Traffic and Accident Database/Active Members
http://www.bast.de/htdocs/fachthemen/irtad/english/actmembers.html

DOCUMENTS AND PRESENTATIONS

OECD, RTR Road Transport Research Programme, *IRTAD Special Report: Compilation and Evaluation of A-level Roads and Hospitalized Victims in OECD Countries, Accident and Injury Definitions*, BAST, Germany, June 1998.

Journal of Transportation and Statistics*, Comparing International Crash Statistics*, December 1999.

Victoria's Road Safety Strategy, *Arrive Alive!*, 2002–2007.

Roads and Traffic Authority: New South Wales, *Road Safety 2010: A Framework for Saving 2,000 Lives by the Year 2010 in New South Wales*.

Victoria Police, *Traffic Collision Investigations; Policy; Procedure; Data Collection and Uses*, November 2003.

VicRoads, *Annual Report 2001–02*.

European Commission, *Saving 20,000 Lives on our Roads: A Shared Responsibility*, 2003.

Consultation Paper on a 3rd Road Safety Action Plan 2002-2010, *A Partnership for Safety*, Brussels, May 2001.
http://europa.eu.int/comm/transport/library/strat-version-def.pdf

Murray Mackay, *Safer Transport in Europe: Tools for Decision-Making*, European Transport Safety Council, Brussels, January 2000.

Pete Thomas, *STAIRS and Future Developments in EU Crash and Injury Data Provision*, Vehicle Safety Research Center, Loughborough University, UK, September 2000.
http://www.lboro.ac.uk/research/esri/vsrc/pdf%20files
PT%20STAIRS%20IRTAD%202000.pdf

EU Transport Accident, Incident and Casualty Databases—Current Status and Future Needs, European Transport Safety Council, 2001.
http://www.etsc.be/database.pdf

FHWA International Technology Exchange Program, *Managing and Organizing Comprehensive Highway Safety in Europe*, April 2003. http://www.international.fhwa.dot.gov/Pdfs/converted_to_html/scanreports/comp/comprehensivemain.htm

Roads and Traffic Authority, Information Section—Road Safety Strategy Branch, *Road Traffic Accidents in New South Wales 2001*, January 2003.

Roads and Traffic Authority, Information Section—Road Safety Strategy Branch, RSTUM Directorate, *Running Sheet of Fatal Accident Data for NSW*, October 2003.

Roads and Traffic Authority, *Traffic Accident Database System (TADS) Data Manual Version 1.6*, July 2003.

Roads and Traffic Authority, *High Level Business Requirements Document for Traffic Accident Database System (TADS) Version 1.0*, June 2003.

Phil Sparkes, *Accident Geocoding*, Safety in the Netherlands conference, Roads and Traffic Authority presentation, October 2003.

Robert Ramsey, *New Traffic Accident Data*, Safety in the Netherlands conference, Roads and Traffic Authority presentation, October 2003.

H.M. Derriks (AVV), *Accident Databases and Traffic Safety Policy*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, September 2003.

Martha Brouwer, *Monitoring and Evaluation by the Road Administration: The Use of Road Safety Data*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management—Directorate South Holland presentation, October 2003.

Paul Wesemann, *Road Safety Research: From Data to Knowledge*, Safety in the Netherlands conference, Institute for Road Safety Research (SWOV)—The Netherlands, presentation for U.S. delegation, October 2003.

Sjef Moerdijk, *This is Holland*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Eugene Banach, *Road Safety Research with AVV: Present and Future Activities*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Ydo de Vries and Herman Mooi, *Dutch Indepth Accident Investigation*, Safety in the Netherlands conference, presentation for U.S. Panel for Traffic Safety Information Systems, TNO Automotive—The Netherlands, October 2003.

William Vermeulen, *Vulnerable Road Users: An Investigation by AVV*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Ad Hellemons, *EU Developments in Police Traffic Enforcement*, Safety in the Netherlands conference, KLPD presentation, October 2003.

Piet Houben, *National Roads Network: The Information Integrator*, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

The Dutch National Travel Survey, Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Eugene Banach, *Recording the Road Accident Data in The Netherlands: Principles of a New Processing Method,* Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Peter Mak, *Riskmapping: How AVV-BI Draws the Picture,* Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Peter Mak, *This is…Basic Information: Bricks and Cement,* Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Eugene Bach, *This is the Road Accidents Database: Road Accident Reporting Process in the Netherlands; an Introduction,* Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

William de Vries, *This is Traffic Data: Some Essentials Related to Road Accident Policy and Management,* Safety in the Netherlands conference, Ministry of Transport, Public Works, and Water Management presentation, October 2003.

Program for Traffic Safety in the Netherlands conference: Visit of American Study Group, AVV Transport Research Center and Ministry of Transport, Public Works, and Water Management; conference held in Rotterdam, Heerlan, and Coriovallumzaal, Oct. 6-7, 2003.

Federal Highway Research Institute (BAST), Introductory Video CD-ROM, Federal Highway Research Institute, February 2000.

Andrew Dorrian, *Regional Road Safety Input—Sydney: Analysis and Usage of Data (Data Models, Systems and Blackspot Analysis),* presentation to the U.S. Federal Highway Administration International Scanning Team, Roads and Traffic Authority—New South Wales, October 2003.

Austroads, brochure, Association of Australian and New Zealand Road Transport and Traffic Authorities, 2003.

Jason Day, *Austroads*, presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Judi Sorbie, *Austroads Road Safety Active Projects 2003-2004,* October 2003.

Brett Johnstone, *Mobile Crane Concessional Benefit Scheme,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Heavy Vehicle Safety in NSW: 2003/04 and Beyond, presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Heavy Vehicles: Issues Paper, October 2003.

Graham Brisbane, *Traffic Safety Information Systems: RTA Overview,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

NSW Compulsory Third Party (Bodily Injury) Insurance Scheme, presentation to the U.S. Federal Highway Administration International Scanning Team, Motor Accidents Authority (MAA), October 2003.

Traffic Safety Information Systems: Answers to Amplifying Questions, presentation to the U.S. Federal Highway Administration International Scanning Team, RTA, October 2003.

FHWA International Scanning Program: Traffic Safety Information Systems, presentation to the U.S. Federal Highway Administration International Scanning Team, RTA, October 2003.

Ron Ferguson, *Road Asset Management System (RAMS),* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

David Pratt, *Automated Detection & Classification of Cracking in Road Pavements,* presentation to the U.S. Federal Highway Administration International Scanning Team, Roads and Traffic Authority New South Wales, October 2003.

NSW Police: Crash Data Management, presentation to the U.S. Federal Highway Administration International Scanning Team, New South Wales Police, October 2003.

Paul Daly, *NSW Police: Crash Data Collection,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Crash Investigation Unit, presentation to the U.S. Federal Highway Administration International Scanning Team, NSW Police—Traffic Services Branch, October 2003.

Transport Management Centre (TMC), presentation to the U.S. Federal Highway Administration International Scanning Team, TMC, October 2003.

Paul Yu, *Traffic Asset Inventory Management System (TAIMS),* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Paul Yu, *PC Inventory: Traffic Control Signal Inventory Database,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Traffic Data Collection, presentation to the U.S. Federal Highway Administration International Scanning Team, RTA, October 2003.

Vehicle Classification System, Austroads, January 1994.

G.J.B. Brisbane, *Signs of Change in Wet Weather Conditions,* proceedings of 2003 U.S. Federal Highway Administration International Scanning Team, October 2003.

Peter Dinan, *Collision Investigations and Data Collection,* presentation to Travel Options Planning Service (TOPS) Senior Management Team, Victoria Police, October 2003.

Ken Russell, *Roadway Data,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Robyn McCutcheon, *Road Information Services,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

David Williamson, *Using Data to Develop Programs,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Eric Howard, *Road Safety Policy and Strategy in Victoria,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Welcome to VicRoads, presentation to the U.S. Federal Highway Administration International Scanning Team, VicRoads International, October 2003.

Dean Zabrieszach, *Intelligent Transport Systems in Victoria,* presentation to the U.S. Federal Highway Administration International Scanning Team, October 2003.

Appendix A
International Contacts

THE NETHERLANDS

Fred Wegman
Managing Director
SWOV Institute for Road Safety Research
Duindoom 32
2260 BB Leidschendam, The Netherlands
E-mail: fred.wegman@swov.nl

Boudewijn Van Kampen
Senior Researcher
Infrastructure, Telematics, and Vehicles Department
SWOV Institute for Road Safety Research
Duindoom 32
2260 BB Leidschendam, The Netherlands
E-mail: boudewijn.van.kampen@swov.nl

Ton Blokpoel
Information and Communication Department
SWOV Institute for Road Safety Research
Duindoom 32
2260 BB Leidschendam, The Netherlands
E-mail: ton.blokpoel@swov.nl

Niels Bos
Data Expert
Information and Communications Department
SWOV Institute for Road Safety Research
Duindoom 32
2260 BB Leidschendam, The Netherlands
E-mail: niels.bos@swov.nl

Dr. Martijn Vis
Senior Researcher
Infrastructure, Telematics, and Vehicles Department
SWOV Institute for Road Safety Research
Duindoom 32
2260 BB Leidschendam, The Netherlands
E-mail: swov@swov.nl

Peter M. Mak
Senior Account Manager
Customer Relations
Ministry of Transport, Public Works, and Water Management

AVV Transport Research Centre
Boompjes 200
P.O. Box 1031
3000 BA Rotterdam, The Netherlands
E-mail: p.m.mak@avv.rws.minvenw.nl

E.J.P. (Eugene) Banach
Cluster Manager, Road Safety
Statistics and Data Management
Ministry of Transport, Public Works, and Water Management
AVV Transport Research Centre
Boompjes 200
P.O. Box 2510
3011 XD Rotterdam
6401 DA Heerlen, The Netherlands
E-mail: e.j.p.banach@avv.rws.minvenw.nl

Drs W. (Willem) de Vries
Cluster Manager, Traffic
Statistics and Data Management
Ministry of Transport, Public Works, and Water Management
AVV Transport Research Centre
Boompjes 200
P.O. Box 1031
3000 BA Rotterdam
6411 GW Heerlen, The Netherlands
E-mail: w.dvries@avv.rws.minvenw.nl

S.H.H. (Saskia) Vos
Consultant, Statistics and Data Management
Ministry of Transport, Public Works, and Water Management
AVV Transport Research Centre
Boompjes 200
P.O. Box 2510
3011 XD Rotterdam
6401 DA Heerlen, The Netherlands
E-mail: s.h.h.vos@avv.rws.minvenw.nl

Drs J.G.M. (Hans) van de Laar
Project Manager, Statistics and Data Management
Ministry of Transport, Public Works, and Water Management
AVV Transport Research Centre
Boompjes 200
P.O. Box 2510
3011 XD Rotterdam
6401 DA Heerlen, The Netherlands
E-mail: j.g.m.vdlaar@avv.rws.minvenw.nl

Ing. P.G.P. Houben M.Sc.
Senior Projectleider Verkeer en Vervoer
Ministry of Transport, Public Works, and Water Management
AVV Transport Research Centre
Postbus 2510
6411 GW Heerlen
6401 DA Heerlen, The Netherlands
E-mail: p.g.p.houben@avv.rws.minvenw.nl

Cor Kuitjten
Senior Advisor
Politie
National Police Agency
3972 LB Driebergen
P.O. Box 100
3970 AC Driebergen, The Netherlands
E-mail: corkuijten@planet.nl

Ad Hellemons E.M.P.M.
Director
Politie
National Police Agency
Laan van Hildernisse-Noord 2B
4617 AE Bergen op Zoom, The Netherlands
E-mail: ad.hellemons.klpd.eu@planet.nl

BELGIUM

Dimitrios Theologitis
Head of Unit
Road Safety and Technology
European Commission
Directorate-General for Energy and Transport
DM28 01/109–B-1049, Brussels, Belgium
E-mail: dimitrios.theologitis@cec.eu.int

Jean-Paul Repussard
Administrateur Principal
Commission Europeenne
Direction Generale Energie et Transports
DM28 01/94–B-1049, Brussels, Belgium
E-mail: jean-paul.repussard@cec.eu.int

Maria Teresa Sanz Villegas
Administrateur Principal
Commission Europeenne
Direction Generale Energie et Transports
DM28 01/92–B-1049, Brussels, Belgium
E-mail: maria-teresa.sanz-villegas@cec.eu.int

GERMANY

Gunter Zimmermann
International Office
Federal Highway Research Institute (BASt)
Bruederstrasse 53
51427 Bergisch Gladbach, Germany
E-mail: zimmermann@bast.de

Dipl.-Ing. Axel Elsner
Head of Section
Accident Statistics, Accident Analysis
Federal Highway Research Institute (BASt)
Bruederstrasse 53
51427 Bergisch Gladbach, Germany
E-mail: elsner@bast.de

Dr. Rudolf Krupp
Head of Section
Safety Concepts
Federal Highway Research Institute (BASt)
Bruederstrasse 53
51427 Bergisch Gladbach, Germany
E-mail: krupp@bast.de

Dipl.-Ing. Christine Kellermann
Section
Research Coordination, Research Programmes, International Cooperation
Federal Highway Research Institute (BASt)
Bruederstrasse 53
51427 Bergisch Gladbach, Germany
E-mail: kellermannc@bast.de

Dr. Ingo Koßmann
Section
Traffic Statistics, Traffic Operation, Traffic Control
Federal Highway Research Institute (BASt)
Bruederstrasse 53
51427 Bergisch Gladbach, Germany
E-mail: kossmann@bast.de

Dipl.-Math. Rolf Kaschner
Regierungsrat, Sachgebiet Brückenbau
Federal Highway Research Institute (BASt)
Krausenstr. 17-20
10117 Berlin, Germany
Phone: 030/23810451

Martin Mönnighoff, Polizeidirektor
Polizei-Führungsakademie
Fachbereich II
Polizeiliches Management
Zum Roten Berge 18-24
48165 Münster, Germany
E-mail: moennighoff@pfa-de

Professor Dipl.-Ing. Dietmar Otte
Technical Manager
Accident Research Unit
Medizinische Hochschule Hannover
Carl-Neuberg-Str. 1
30625 Hannover, Germany
E-mail: Otte.Dietmar@mh-hannover.de

Dipl.-Dolmetscher, Dipl.-Übersetzer
Interpretor—English, French, German
Herbert K. Eißmann
Praxis für Dolmetschen & Übersetzen
Dorfanger 21, D-65191 Wiesbaden, Germany
Phone: +49 (0) 6 11/50 84 98
E-mail: eissmann@nexgo.de

Christian Vogt, Geschäftsführer
GIS CONSULT
Schultenbusch 2
45721 Haltern, Germany
E-mail: VOGT@GIS-CONSULT.DE

Dipl.-Ing. Sabine Degeners
Coordinator, Traffic Management and Behaviour in Road Traffic
German Insurance Association (GDV)
German Insurance Institute for Traffic Engineering
Friedrichstr. 191, 10117 Berlin, Germany
E-mail: s.degener@gdv.org

AUSTRALIA

Andrew Houghton
Manager
VicRoads International
International Projects
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: andrew.houghton@roads.vic.gov.au

Susan Bogdanovski
Manager, Business Development
VicRoads International
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: susan.bogdanovski@roads.vic.gov.au

Eric Howard
General Manager—Road Safety
VicRoads
Road Safety
4th Floor
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: eric.howard@roads.vic.gov.au

Robyn McCutcheon
Team Leader
Information and Application Support
VicRoads
Information Services Department
Level 1, North Building
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: robyn.mccutcheon@roads.vic.gov.au

Ken Russell
Manager, Asset Management
VicRoads
Road System Management
3rd Floor
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: ken.russel@roads.vic.gov.au

Philip Gammon
Senior Data Analyst
VicRoads
Information Services Department
Level 1, North Building
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: philip.gammon@roads.vic.gov.au

Dean Zabrieszach
Manager, Intelligent Transport Systems
VicRoads
Traffic and Transport Integration Department
Ground Floor
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: dean.zabrieszach@roads.vic.gov.au

David Williamson
P. Eng.
Principal Program Consultant (Statewide Blackspot Program)
VicRoads
Road Safety
4th Floor
60 Denmark St., Kew
Victoria, Australia 3101
E-mail: williad@vrnotes.roads.vic.gov.au

Peter Dinan
Inspector
Victoria Police
637 Flinders St.
Melbourne 3005
Victoria, Australia

Ray Taylor
General Manager
Business and Marketing Group
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: rayt@arrb.com.au

Michael Tziotis
Research Manager—Safety and Traffic
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: michaelt@arrb.com.au

James Kerner
Senior Research Engineer
Safety and Traffic
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: jamesk@arrb.com.au

Robert Klein
Manager
Road Safety (International)
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: robert.klein@roads.vic.gov.au

Rob McInerney
State Manager, Queensland
ARRB Transport Research Ltd.
P.O. Box 220
Albion, QLD 4010, Australia
E-mail: robm@aarb.com.au

Melissa Coutts
Behavioural Scientist
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: melissac@arrb.com.au

Rod George
Technology Group
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: rodg@arrb.com.au

Ronald Elliott
Principal Technical Officer
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: rone@arrb.com.au

Roland Leschinski
Chief Engineer
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: roland@arrb.com.au

Brett Eastwood
Operations Manager, Technology
ARRB Transport Research Ltd.
500 Burwood Highway
Vermont South VIC 3133, Australia
E-mail: brette@arrb.com.au

Ian Johnston
Professor and Director
Accident Research Centre
Monash University
Building 70, Clayton Campus
Victoria 3800, Australia
E-mail: Ian.Johnston@general.monash.edu.au

Dr. David Logan
Vehicle Safety Manager
Accident Research Centre
P.O. Box 70A
Victoria 3800, Australia
E-mail: david.logan@general.monash.edu.au

Professor Brian Fildes
Accident Research Centre
P.O. Box 70A
Victoria 3800, Australia
E-mail: Brian.Fildes@general.monash.edu.au

Bruce Corben
Senior Research Fellow
Accident Research Centre
P.O. Box 70A
Victoria 3800, Australia
E-mail: bruce.corben@general.monash.edu.au

Sue Sinclair
Director
Road Safety and Road User Management
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
DX13 Sydney, Australia
E-mail: Sue_Sinclair@rta.nsw.gov.au

Dr. Graham Brisbane
Manager
Road Environment and Light Vehicle Standards
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
DX13 Sydney, Australia
E-mail: Graham_Brisbane@rta.nsw.gov.au

Mike Veysey
General Manager
Roads and Traffic Authority (RTA)
P.O. Box 558 Blacktown NSW 2148
Australia
E-mail: Michael_Veysey@rta.nsw.gov.au

Justin McGuire
Manager, Heavy Vehicle Safety and Standards
Road Safety Strategy Branch
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
Australia
E-mail: Justin_McGuire@rta.nsw.gov.au

Ron Ferguson
Manager
Information Technology
Infrastructure Maintenance Branch
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
DX13 Sydney, Australia
E-mail: Ron_Ferguson@rta.nsw.gov.au

Joanne Anastas
Manager
Data Acquisition and Information
Road Safety and Road User Management
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
DX13 Sydney, Australia
E-mail: Joanne_Anastas@rta.nsw.gov.au

Robert Ramsay
Manager, Information
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238,
Australia
E-mail: Robert_Ramsay@rta.nsw.gov.au

Ray Daltrey
Manager, Traffic Information
Traffic Information Branch
Roads and Traffic Authority (RTA)
P.O. Box K198 Haymarket NSW 1238
DX13 Sydney, Australia
E-mail: Ray_Daltrey@rta.nsw.gov.au

Phil Akers
General Manager
Roads and Traffic Authority (RTA)
Transport Management Centre
25 Garden St.
Eveleigh NSW 1430, Australia
E-mail: phil_akers@rta.nsw.gov.au

Damien Chee
A/g Accident Investigation and Blackspot Program Manager
Road Environment and Light Vehicle Standards
Road Safety Strategy
Roads and Traffic Authority (RTA)
P.O. Box K198
Haymarket NSW 1238, Australia
E-mail: Damien_chee@rta.nsw.gov.au

Anna Chevalier
Planning and Analysis Manager
Road Safety and Traffic Management, Southern Region
Roads and Traffic Authority (RTA)
P.O. Box 477
Wollongong East NSW 2520, Australia
E-mail: anna_chevalier@rta.nsw.gov.au

Andrew Dorrian
Crash Analysis Unit, Team Leader
Road Safety Services (Sydney Region)
Roads and Traffic Authority (RTA)
P.O. Box 558
Blacktown NSW 2148, Australia
E-mail: Andrew_dorrian@rta.nsw.gov.au

Gavin Hill
A/g Manager, Compliance Systems
Compliance Strategy Branch
Road Safety Strategy Branch
Roads and Traffic Authority (RTA)
P.O. Box K198
Haymarket NSW 1238, Australia
E-mail: gavin_hill@rta.nsw.gov.au

David Pratt
Pavement and Condition Manger
Information and Technology Section
Roads and Traffic Authority (RTA)
P.O. Box K198
Haymarket NSW 1238, Australia
E-mail: david_pratt@rta.nsw.gov.au

Peter Jenkins
Senior Sergeant
Commander
NSW Police
Traffic Services Branch
Crash Investigation Unit
130 George Street
Parramatta NSW 2150, Australia
E-mail: jenk1pet@police.nsw.gov.au

Kwame Atsu
Principal Officer, Statistics
Insurance Division
Motor Accidents Authority
580 George Street
Sydney NSW 2000, Australia
E-mail: katsu@maa.nsw.gov.au

Professor Danny Cass
NSW Chief Executive Officer
NSW Institute of Trauma and Injury Management (ITIM)
51 Wicks Road
North Ryde 2113, Australia
E-mail: dannyc@chw.edu.au

Appendix B
Team Members

CONTACT INFORMATION

Michael L. Halladay (Co-Chair)
Director
Office of Program Integration and Delivery (HAS-30)
Office of Safety (Room 3419)
Federal Highway Administration
400 Seventh St., SW
Washington, DC 20590
Phone: 202–366–9469
Fax: 202–366–3222
E-mail: michael.halladay@fhwa.dot.gov

Susan Martinovich (Co-Chair)
Deputy Director
Nevada Department of Transportation
1263 South Stewart St.
Carson City, NV 89712-0002
Phone: 775–888–7440
Fax: 775–888–7201
E-mail: smartinovich@dot.state.nv.us

Mike Crow
Bureau Chief, Traffic Engineering
Kansas Department of Transportation
217 SE Fourth St.
Topeka, KS 66612
Phone: 785–296–3618
Fax: 785–296–3619
E-mail: mikec@ksdot.org

Barbara Hilger DeLucia (Report Facilitator)
President and Chief Executive Officer
Data Nexus, Inc.
P.O. Box 11770
College Station, TX 77842-1770
2700 Earl Rudder Freeway South, Suite 1550
College Station, TX 77845
Phone: 979–696–3400
Fax: 979–696–3404
E-mail: bdelucia@data-nexus.com

James W. Ellison
County Traffic Engineer
Pierce County Public Works and Utilities

2401 South 35th St., Room 150
Tacoma, WA 98409-7485
Phone: 253–798–7250
Fax: 253–798–3661
E-mail: jelliso@co.pierce.wa.us

Michael S. Griffith
Technical Director
Office of Safety Research and Development
Federal Highway Administration, HRDS-02
6300 Georgetown Pike
McLean, VA 22101
Phone: 202–493–3316
Fax: 202–493–3417
E-mail: mike.griffith@fhwa.dot.gov

David L. Harkey
Associate Director for Operations
University of North Carolina
Highway Safety Research Center
CB# 3430
730 Airport Rd.
Chapel Hill, NC 27599
Phone: 919–962–8705
Fax: 919–962–8710
E-mail: david_harkey@unc.edu or harkey@claire.hsrc.unc.edu

J. Kevin Lacy
Traffic Safety Systems Engineer
North Carolina Department of Transportation
1561 Mail Service Center
Raleigh, NC 27699–1561
Phone: 919–733–5418
Fax: 919–733–2261
E-mail: jklacy@dot.state.nc.us

David S. (Scott) MacGregor
Assistant Chief
California Highway Patrol
2555 First Avenue
Sacramento, CA 95818–2696
Phone: 916–657–7255
Fax: 916–657–7324
E-mail: smacgregor@chp.ca.gov

Donald (Don) J. McNamara
Regional Administrator
National Highway Traffic Safety Administration (NHTSA)
Region 5, Suite 201
19900 Governors Dr.
Olympia Fields, IL 60461
Phone: 708–503–8892/8822, Ext. 13
Fax: 708–503–8991
E-mail: dmcnamara@nhtsa.dot.gov

Betty L. Serian
Deputy Secretary for Safety Administration
Pennsylvania Department of Transportation
1101 South Front St.
Harrisburg, PA 17105
Phone: 717–787–3928
Fax: 717–705–1046
E-mail: bserian@state.pa.us

BIOGRAPHIC SKETCHES

Michael L. Halladay (FHWA Co-Chair) is director of the Office of Program Integration and Delivery for the Office of Safety at the Federal Highway Administration (FHWA). This office leads safety strategy and performance planning for FHWA, develops safety research and technology programs, supports strategic highway safety planning, and integrates safety programs and issues with other key initiatives. Before that, Halladay served as a chief of the FHWA Technology Management Division, where he directed research and technology strategic planning and evaluation initiatives and facilitated development of broad-based strategic partnerships for national research and technology delivery programs. He has a bachelor's degree in civil engineering from Duke University and is a registered professional engineer in Virginia. Halladay is a member of the American Society of Civil Engineers and the Institute of Transportation Engineers, and is active on several Transportation Research Board committees.

Susan Martinovich (AASHTO Co-Chair) is the deputy director for the Nevada Department of Transportation. Martinovich is responsible for the planning, design, and operation of projects for the State's highway system. Her duties include oversight of road and bridge design, traffic and safety, intelligent transportation systems, environmental matters, location and survey, and right-of-way. A major priority is developing and using traffic and accident data to maximize the strategies for design projects. She has worked for the Nevada department for 19 years. Martinovich has a bachelor's degree in civil engineering from the University of Nevada and is a licensed professional engineer in Nevada and California. She is a member of the American Association of State Highway and Transportation Officials Standing Committee on Highways, vice-chair of the Subcommittee on Design, vice-chair of the Standing Committee on Highway Traffic Safety, and chair of the Non-Motorized Task Force. She is also a member of the Transportation Research Board's Future Strategic Highway Research Program Committee.

Barbara Hilger DeLucia (Report Facilitator) is the chief executive officer of Data Nexus, Inc., a firm specializing in transportation and safety consulting and systems. She has worked with numerous local, State, and Federal agencies to improve their processes for capturing, managing, and analyzing safety and transportation data. DeLucia has 23 years' experience in transportation and safety information systems development and research. She was formerly head of the Accident Analysis Division of the Texas Transportation Institute, where she was involved in information and technology research for a number of transportation disciplines. DeLucia has a bachelor's degree from the University of North Texas and a master's degree in public administration from Texas A&M University. She served on the Transportation Research Board (TRB) Task Force to Define Comprehensive Computerized Safety Recordkeeping Systems, the National Research Council's Steering Committee for the Study of State Traffic Records Systems, the CADRE Task Force to define essential safety data needs, the National Cooperative Highway Research Program (NCHRP) panel for Accident Data Quality, and the National Safety Council (NSC) panel to develop a National Agenda for Highway Safety Information Systems. She currently serves on the NSC Traffic Records Committee, TRB Committee for Safety Data Analyses and Evaluation, and NCHRP safety advisory panel for the Future Strategic Highway Research Program (F-SHRP).

Mike Crow is chief of the Bureau of Traffic Engineering at the Kansas Department of Transportation. His bureau is responsible for crash analysis, signing, lighting, and pavement markings statewide. Crow is also chairman of the American Association of State Highway and Transportation Officials' national Transportation Safety Information Management System (TSIMS) project. Crow is a graduate of the University of Missouri at Rolla and holds a master's degree in civil engineering from Kansas State University. He is a licensed professional engineer in Kansas. He is a member of the National Committee on Uniform Traffic Control Devices and the American Traffic Safety Services Association.

James W. Ellison is the county traffic engineer for Pierce County, WA. Ellison directs the traffic engineering, operations, and maintenance functions on the county's more than 2,424 km (1,500 miles) of roads. His responsibilities include compiling and analyzing crash data, conducting safety studies, and developing short-term and long-range countermeasures to enhance safety on the county road system. Before joining Pierce County in 1983, he served 5 years each as a project engineer for Transportation Planning & Engineering, Inc. in Bellevue, WA, and as assistant traffic engineer for the city of Kent, WA. Ellison has a bachelor's degree in civil engineering from the University of Washington and serves on technical committees of the National Association of County Engineers, Transportation Research Board, National Committee on Uniform Traffic Control Devices, and Institute of Transportation Engineers.

Michael S. Griffith works for the Federal Highway Administration in the Office of Safety as acting director for the Office of Safety Design. One of his primary responsibilities as acting director is to ensure that safety programs are comprehensive and data driven. He is involved in national initiatives to improve the collection, integration, and analysis of highway safety data. In Griffith's permanent position in the Office of Safety Research and Development, he directs the SafetyAnalyst project on developing state-of-the-art analytical tools for safety management. His research emphasis areas include highway safety data, analytical tools for safety management, development of relationships between safety and highway geometric design elements, and before-and-after evaluation of the safety effects of highway improvements. Griffith is a business management graduate of Ithaca College, and has a master's degree in statistics from State University of New York at Buffalo and a master's degree in transportation engineering from the University of Maryland. He serves as chair of the Transportation Research Board Committee on Statistical Methodology and Statistical Computer Software in Transportation Research.

David L. Harkey is the associate director for operations and a senior research engineer at the University of North Carolina Highway Safety Research Center. His research focus is on applying transportation engineering principles and research evaluation methodologies to improve highway safety for motorists, pedestrians, and bicyclists in the areas of traffic operations, geometric design, and roadside design. He has conducted numerous research projects involving crash, roadway inventory, and traffic operations data collected at the local, State, and national levels. He serves as the co-principal investigator for the Highway Safety Information System sponsored by the Federal Highway Administration. Harkey has more than 18 years' experience in transportation safety research, including 10 with the Highway Safety Research Center. Harkey has a bachelor's degree in civil engineering and a master's degree in engineering from the University of North Carolina at Charlotte. Harkey is a registered professional engineer in North Carolina. He serves on several committees for the Transportation Research Board, including the Committee on Safety Data, Analysis, and Evaluation.

J. Kevin Lacy is the traffic safety systems engineer for the North Carolina Department of Transportation. Lacy is responsible for managing the Traffic Safety Systems Management Unit (TSSMU) in the Traffic Engineering and Safety Systems Branch. The mission of TSSMU includes developing strategies at the statewide and project levels for improving highway safety at the planning, design, construction, operation, and maintenance phases of the transportation program. He is a graduate of North Carolina State University and is a licensed professional engineer. Lacy has more than 10 years' experience in highway safety engineering, including more than 9 years with the North Carolina DOT and a year with the University of North Carolina Highway Safety Research Center. He is active in many areas of transportation data and chairs the North Carolina Traffic Records Coordinating Committee.

David Scott MacGregor is an assistant chief with the California Highway Patrol (CHP). He serves as assistant commander of CHP's Planning and Analysis Division. In this capacity, he helps manage the department's Emergency Operations, Research and Planning, Special Projects, and Grants Management sections. He also manages CHP's Emergency Notification and Tactical Alert Center (ENTAC), which helps coordinate California's Amber Alert system for abducted children. Before his appointment as assistant chief, MacGregor was a field commander in Ventura, CA, and previously served as the department's assistant special representative to the

California State Legislature. MacGregor has a bachelor's degree in criminal justice from California State University at Sacramento and is a graduate of the Federal Bureau of Investigation's National Academy. He is a member of the International Association of Chiefs of Police, California Peace Officers' Association, and California Association of Highway Patrolmen.

Donald J. McNamara is the regional administrator for the National Highway Traffic Safety Administration (NHTSA) in Olympia Fields, IL. McNamara is responsible for NHTSA highway safety program activities for the six Midwest States of Illinois, Michigan, Ohio, Indiana, Minnesota, and Wisconsin, which cover a population of more than 52 million. McNamara, a career employee with more than 30 years' experience in highway safety, was appointed to his current position in March 1990. Before that, he held various management and staff positions with NHTSA, the Federal Highway Administration, and the U.S. Department of Transportation's Office of Inspector General. He is considered an expert in the areas of occupant protection, impaired driving, and highway safety information systems. He has a bachelor's degree in accounting from Southern Illinois University and is a graduate of the Federal Executive Institute in Charlottesville, VA. He is a licensed certified public accountant in Illinois and a member of various professional organizations. He serves on various legislative and governor-appointed task forces and advisory groups.

Betty L. Serian is the deputy secretary for safety administration for the Pennsylvania Department of Transportation in Harrisburg, PA. Serian directs all driver and vehicle services for Pennsylvania's more than 8 million drivers and nearly 11 million vehicle owners. Her administrative responsibilities include key driver safety and sanctioning programs, commercial and non-commercial driver testing and retesting, registering and titling of commercial and non-commercial vehicles, and delivery of driver and vehicle customer services through various channels. She is directly responsible for developing safety-focused programs, using and analyzing crash data, to improve driver and vehicle performance. Before her 1995 appointment as deputy secretary, Serian served as director of customer relations. She has been with the department for 22 years. Serian holds bachelor's degrees in journalism and political science from Indiana University of Pennsylvania. She recently served as board chair for the American Association of Motor Vehicle Administrators and is past chair and a member of the organization's Executive Committee.

Appendix C
Amplifying Questions

The following is a list of questions on the areas that the U.S. panel would like to discuss with you. These questions are intended to clarify and expand on the panel topics of interest described in the panel overview paper. These questions have been organized by general topics (such as policy, systems, and linkages), traffic crash data collection for both routine and special crash investigations, and roadway features data collection.

The panel is very interested to learn of any innovative methods or technologies that have been employed in both the collection and automation of these data, as well as the access and use of these data for safety programs. Examples of both successful and not-so-successful applications are of interest and will allow for a broader understanding of these issues. If possible, the panel would like to devote some portion of its time with you for site visits to observe the methods and technologies discussed, particularly in the area of field data collection.

GENERAL—ISSUES INCLUDING POLICY, SYSTEMS, AND LINKAGES

1. What have been your most successful programs in building roadway safety data systems? Who are the innovators in these areas?

2. Who are the key stakeholders in your country involved in safety data programs?

3. What is your vision for the future on creating better traffic safety information systems?

4. What types of data do you collect and automate to evaluate roadway safety? What are the amounts of each type of data collected (such as annual number of crashes and number of miles of roadway)?

5. Who maintains each file? Is it the primary user or a central data collection agency? If it is the primary user, has file sharing with the central database or other users been a problem? If yes, how was this resolved?

6. How have you been successful in encouraging owners of different safety data systems to share information and allow each other access rights, etc.?

7. What laws, regulations, or incentives exist that encourage or motivate local agencies (such as cities, townships, villages, etc.) to dedicate their resources to developing, using, and maintaining integrated safety and roadway features databases?

8. Do you have examples of public agency-private sector partnerships that effectively share safety data information?

9. How have you been able to balance the safety data needs and interests from the traffic safety community (such as a traffic engineer or safety research scientist) with the concerns of those who first respond to the crash site and collect the data by filling out the collision report (such as local police)?

10. What kind of linkages does your information system have between the crash file and other safety-related data files, such as the roadway inventory file, traffic flow file, medical data files (emergency medical services, hospital, rehabilitation), driver licensing/history file, and other files?

11. What are the primary considerations or challenges in effectively linking roadway feature inventories with crash databases?

12. Do transportation departments have access to crash databases that can match crash frequencies and measures of crash severity to specific roadway locations? How do you ensure accurate location data on the crash report?

13. If you could start over and not have to retrofit what you have now, what would you do differently to your system to make it better? What are some of the lessons you have learned?

CRASH DATA—COLLECTION AND ACCESSIBILITY OF ROUTINE AND SPECIAL TRAFFIC CRASH DATA

1. What agencies collect your traffic crash data? Do law enforcement agencies use specialized crash investigation teams? Are non-sworn police officers (such as civilian crash investigators) involved in data collection? What are the criteria for determining what type of investigator is sent to the scene of a crash?

2. What types of training are provided to those collecting crash data?

3. Is there a uniform collision report form used by all investigating agencies in a jurisdiction (regional level, country level, or union level)? Who determines which variables appear on the standard collision report form (such as police agency, engineering department, committee)? In developing your standard collision report form, how have you been able to balance the need and interest for more data with the practical aspects of collecting and reporting data in a timely and accurate manner?

4. What type of information is collected about a traffic crash? (Please provide an example of your crash form or a listing of the data collected about the crash.) Is the following information being collected?

- Crash location
- Type of vehicle
- Crash description
- Driver age
- Injuries
- Aggressive driving (if so, how is this defined?)
- Time
- Seatbelt use

- Road condition
- Non-attentive driving
- Weather condition
- Alcohol or drug use by the driver5.

Is technology (such as computers, accident data recorders, or other onboard telemetry, etc.) used to collect the crash data? How much of the data are collected using computers in the field versus on paper forms? If you use computerized crash forms, are the forms tailored to specific crash situations (such as a different form for material damage-only crashes or an expert form that tailors later questions to the responses of earlier questions)? What innovative non-technological strategies do you recommend or has your country used to collect traffic crash data (for example, non-sworn accident investigators)?

6. Are all crashes reported and, if not, what criteria are used to decide whether a crash is reported? Have there been recent changes in these reporting criteria? Is your jurisdiction dealing with pressure to collect data about fewer crashes? How are you handling these pressures (for example, do law enforcement agencies take reports on material damage-only crashes)? Do the reporting criteria for the centralized systems differ from that used in local agencies (for example, the centralized data reflect only crashes involving fatalities and injuries, while local systems also contain data on material damage-only crashes)? Is there a different method of collecting data about material damage crashes?

7. What methods or systems have you employed to accurately establish the location of each crash? How accurate is this location information? Are special programs or methods used to increase the location accuracy? Are GIS coordinates used to identify locations? If so, how are these coordinates captured (for example, using GPS receivers in the police vehicles)?

8. Who has access to the automated crash data? Who can make changes to these data?

9. Do you employ technologies or techniques to speed up the process of crash investigation when the crash occurs during a heavy traffic period?

10. How do you conduct indepth crash investigations to capture more complete data for determining the causes and contributing factors of crashes? What are the criteria for selecting crashes to be reported by crash investigation teams?

11. For investigations of especially severe crashes or for special analytical studies, what types of technologies are used over and above regular crash investigations? Does the use of these technologies result in a more efficient investigation, save time in data collection, or have other advantages?

ROADWAY DATA—COLLECTION AND ACCESSIBILITY OF DATA DESCRIBING ROADWAYS, ROADSIDE APPURTENANCES, TRAFFIC CONTROL DEVICES, STRUCTURES, TRAFFIC VOLUME, ETC.

1. What agency or agencies collect and maintain your roadway inventory data? Are these data maintained in a manual file or in computerized files?
2. What are the basic types of roadway variables collected? (Specific questions on variables in each type are included later.)
   - Cross-section items (such as number of lanes, shoulder type or width)
   - Roadway structures (such as bridges)
   - Roadway alignment (such as horizontal curvature, grade, vertical curves)
   - Intersection inventory (such as number and type of lanes on each approach)
   - Roadside inventory (such as sideslope or guardrail presence)
   - Traffic data (such as annual traffic volumes)
3. How often are your basic roadway inventory data checked or updated and how do you do this (for example, updates based on as-built plans for reconstruction projects or new roadways)?
4. Are roadways physically marked or delineated to specify roadway and crash locations and/or specific design features (for example, are kilometer marker signs used for inventory purposes)?
5. What are the roadway cross-section items collected (for example, number of lanes, widths and types of lanes and shoulders, median widths and types)?
6. Does your inventory include data about bridges, railroad grade crossings, multi-use paths, pedestrian facilities, tunnels, and other features?
7. Are horizontal curvature and vertical grade/curve data collected? If so, how are these data collected (for example, from as-built plans or from an instrumented vehicle)? Are these data maintained in an automated or manual file?
8. Are intersection inventory data collected? If so, what data are collected (for example, number of lanes/approach, signal timing data, etc.)? Are these data maintained in an automated or manual file?
9. Are roadside inventory data collected (for example, slope measurements, extent of clear zone, or roadside object inventory such as guardrails)? If so, how are these data collected? How are these data maintained and updated?
10. Can your roadway feature data be displayed on an automated geographic information system (GIS)?

11. Is computer-based technology used to collect information about any of the above roadway and intersection characteristics data? Is this information maintained in a computerized file? Have these data been validated for their accuracy (that is, compared to ground survey data)? If so, how accurate are they?

12. Are you using innovative methods or technologies to collect basic traffic volume data? Are the traffic counts collected used to extrapolate to other roadway segments that do not have counts?

13. How are traffic counts for commercial trucks and buses or other specialized vehicles collected? Are different types of trucks and buses differentiated in the counts? Are these specialized counts as complete as those in the basic count system? Do you have traffic counts collected by driver type, age, or gender? How do you collect these counts?

Appendix D
PROV Dutch Safety Survey
(Translated)

January 2002

Recurrent regional study about traffic safety in the year 2001

Dear Sir or Madam,

Some time ago you volunteered to participate in a traffic study by sending in an answer card. In front of you is the booklet that belongs to this study.

In this booklet you will find various questions about traffic. These questions are about traffic safety, what you have experienced while participating in traffic, what your opinion is about certain traffic issues, etc. These questions are asked on request of the Department of Traffic. This department wants to know more about your behavior while participating in traffic and what are, according to you, the most important measures to make traffic safer.

What do we ask from you?
We would like to be sure that the person to whom this survey booklet is addressed answers the questions **himself or herself**. **It does not matter whether you have a driver's license or not, because there are all kinds of questions in this survey for people who do not possess a license.**

We also ask you to read the questions well before you answer them, and to completely fill in the questionnaire. Once all questions answered, please send the completed survey booklet as soon as possible to Traffic Test in the enclosed envelope **(a stamp is not necessary)**.

Have a chance to win a gift voucher!
Once you have completed the survey and included your name and address at the end, you have a chance to win one of the **100 gift vouchers of 20 EURO** that will be raffled in the group of approximately 3,000 people submitting the survey.

How to fill in the questionnaire
You can answer most questions by placing a circle in front of the letter or number in front of the answer. Give one answer per question. Only when it is explicitly noted that **"you may place a circle around more than one answer"** can you give more answers (for instance, question 9). Where you see a dotted line, fill in the answer yourself (for example, questions 1 and 3). For multiple choice questions, put a checkmark in the box that best fits your answer.

If you do not understand one or more questions, you can call Traffic Test (0318-544735). Ask for Irma Avezaat or Arlette Hazevoet.

Your information will be confidential and you will remain anonymous. Thank you for your cooperation.

Yours faithfully,

Drs. I.H. Veling, managing director Traffic Test BV

General

1. What is your ZIP Code? **(Enter numbers only.)**

   ....

2. Gender:
   1. Man
   2. Woman

3. Age:

   .... years old

4. What is the highest level of education you have completed?
   1. Elementary school
   2. High school
   3. College, university
   4. Other ....

5. Marital status:
   1. Married
   2. Living together
   3. Widow
   4. Single
   5. Live with parents
   6. Other ....

6. Do you have children under 17 living with you?
   1. Yes
   2. No

7. Do you work more than 12 hours a week?
   1. Yes
   2. No

8. According to you, what is the biggest traffic problem? **(Circle only one answer.)**
   1. Traffic jam
   2. No parking
   3. Pollution
   4. Unsafe traffic
   5. Other …………………...

9. Do you have a moped certificate or one of the following driver's licenses? How long have you had this certificate or license? **(You may circle one or more answers.)**
   1. Moped certificate ……..years
   2. A-driver's license (motorbike) ……..years
   3. B-driver's license (passenger car) ……..years
   4. C-driver's license (truck) ……..years
   5. D-driver's license (bus) ……..years
   6. E-driver's license (trailer) ……..years
   7. I do not have a moped certificate or driver's license.

10. What kind of transportation did you drive at least once in 2001? **(You may circle one or more answers.)**
    1. Passenger car
    2. Pickup or minibus
    3. Truck
    4. Coach
    5. Bicycle
    6. Moped (Spartamet)
    7. Moped (moped scooter)
    8. Motor bike
    9. Roller skates, skates, or inline speed skates
    10. Other …………………………
    11. I did not use any means of transport as a driver in 2001.

Traffic safety

11. You get into an accident. What do you think is the main reason? **(You may circle more than one answer.)**
    1. My own mistake
    2. A mistake of other traffic users
    3. A dangerous traffic situation
    4. Problems with the vehicle
    5. Unforeseen circumstances (for instance, fog, sudden slipperiness, low sun)
    6. How well you look around

12. Did you have one or more traffic accidents in 2001? A "traffic accident" is defined as a collision or fall that happened to you on a public road that led to damage or injury to yourself or others.
    1. Yes
    2. No **(Continue with question 18.)**

13. If you answered yes to the previous question, how many accidents did you have in 2001?

    .... accidents

14. What traffic accidents were you involved in during 2001? **Note the vehicle in which you had the accident and the other person's vehicle.** If you or the other party was walking, call the vehicle "walking."

	1st accident	2nd accident	3rd accident
a. What type of vehicle were you using? **(Choose a method of transport from the list of question 10.)**	....	....	....
b. Was there a collision with someone else?	yes/no	yes/no	yes/no
c. If yes, what type of vehicle was the other person using? **(Choose a method of transport from the list of question 10.)**	....	....	....
d. Any material damages?	yes/no	yes/no	yes/no
e. Were you injured?	yes/no	yes/no	yes/no
f. Were you sent to the hospital?	yes/no	yes/no	yes/no
g. Were others injured?	yes/no	yes/no	yes/no
h. Was anyone else sent to the hospital?	yes/no	yes/no	yes/no
i. Were there casualties?	yes/no	yes/no	yes/no
j. Did the accident take place in Holland?	yes/no	yes/no	yes/no
k. If yes, where exactly?	....	....	....
l. How far were you from home?	…….km	…….km	…….km

15. Were any of the accidents caused by any physical or mental disability? **(You may circle more than one answer.)**
    1. Yes, caused by stress
    2. Yes, by fatigue
    3. Yes, I was sick/not feeling well
    4. Yes, by something else ……………………………………
    5. No

16. Were one or more of these accidents caused partly because you were dealing with issues other than traffic? **(You may circle more than one answer.)**
    1. Yes, cell phone
    2. Yes, radio/CD player
    3. Yes, by smoking
    4. Yes, by eating
    5. Yes, by drinking
    6. Yes, by reading the map
    7. Yes, because I was looking for something
    8. Yes, by talking to a passenger
    9. Yes, by children who asked for attention or care
    10. Yes, by something else ……………………………………
    11. No

17. Were any of the accidents caused because you were distracted by issues happening outside the car? **(You may circle more than one answer.)**
    1. Yes, by another accident on the road
    2. Yes, by a fire or an explosion in the area of the road
    3. Yes, by an airplane that was flying low
    4. Yes, by an advertising poster
    5. Yes, by a striking person
    6. Yes, by something else ……………………………………
    7. No

18. Were you ever stopped by the police for traffic surveillance in 2001? **(You may circle more than one answer whether you were fined or not.)**
    1. Yes, speed check
    2. Yes, alcohol check
    3. Yes, check whether safety belts were used
    4. Yes, check whether helmets were carried
    5. Yes, check on lights
    6. Yes, check on something else..
    7. No

19. Were you ever fined in 2001? Why were you fined? Do not forget to note the number of times you were fined and which transport means you were using **(see list at question 10)** when you were fined! **(You may circle more than one answer.)**

	Number	Means of Transport
a. Not wearing seatbelt	....	....
b. Speeding on the highway	....	....
c. Speeding on another road in another city or village	....	....
d. Speeding within city or village	....	....
e. Illegal parking	....	....
f. Drunk driving	....	....
g. Driving through the red light	....	....
h. No lights on means of transport	....	....
i. Not wearing helmet	....	....
j. Not giving priority	....	....
k. Driving too close to a vehicle in front	....	....
l. Unnecessary driving in left lane on a road with more than two lanes	....	....
m. Other............................	....	....
n. I was not fined in 2001	....	....

20. Did you use a moped in 2001? **(yellow plate, not a motor-assisted bicycle)**
    1. Yes
    2. No **(Continue with question 29.)**

21. Approximately how many times did you ride a moped in 2001?
    Average…………………times a week

22. How many kilometers did you drive in 2001?
    Average…………………kilometers per ride

23. Why do you use a moped? **(You may circle more than one answer.)**
    1. To drive from home to school (and back)
    2. For driving from home to work
    3. For private purposes (for instance, visits to family, groceries)
    4. For holidays or recreation

24. How often did you wear a helmet on your moped?
    a. During the latest 10 rides that took **less** than 5 minutes: ....times
    b. During the latest 10 rides that took **longer** than 5 minutes: ....times

25. Why do you wear a helmet?
    (You may circle more than one answer.)
    1. Habit
    2. It is obligatory
    3. Because of the risk of getting fined
    4. Because I believe it is dangerous to ride without a helmet
    5. For another reason, namely ....
    6. I never carry a helmet. **(Continue with question 27.)**

26. When you wear your helmet, is it safely fixed?
    1. Yes, always
    2. Sometimes
    3. Never

27. When you are **not** wearing your helmet, what is the reason?
    (You may circle more than one answer.)
    1. I do not think wearing a helmet is comfortable
    2. When you have an accident, it does not matter whether you are wearing a helmet or not
    3. I will never have an accident anyway
    4. None of my friends wear a helmet
    5. My hair will get dirty or greasy
    6. Other ....
    7. I always wear a helmet

28. How fast do you drive on your moped when the traffic is not that busy?
    a. On roads **within** town or village: .... km/hour
    b. On roads **outside** town or village: .... km/hour

29. Did you use a motor-assisted bicycle in 2001?
    1. Yes
    2. No **(continue with question 34.)**

30. Does this motor-assisted bicycle look like a scooter/moped or like a push bike?
    1. Looks like a scooter/moped
    2. Looks like an ordinary push bike
    3. Do not know

31. On average, how many times a week did you ride a motor-assisted bicycle in 2001?
    Average…………………a week

32. How many kilometers did you average per ride in 2001?
Average…………………kilometers a ride

33. How fast do you ride your motor-assisted bicycle when there is not much traffic?
   a. On roads **within** city or village: ……..km/hour
   b. On roads **outside** city or village: ……..km/hour

34. Did you ride a bike in 2001?
   1. Yes
   2. No **(Continue with question 41.)**

35. How many times did you ride a bike a week in 2001?
Average………………a week

36. How many kilometers did you ride in 2001?
Average…………………kilometer per ride

37. For what reason do you usually ride your bike? **(You may circle more than one answer.)**
   1. To ride from house to school (and back)
   2. To ride between house and work
   3. For private purposes (for instance, visits to family, groceries)
   4. For holidays or leisure
   5. For exercise/conditioning/sport

38. When it is dark, do you turn on your lights? **(Put a cross in the correct box.)**

	Never	Hardly ever	Some-times	Almost always	Always	Not applicable
a. On roads **within** town or village	1.❑	2.❑	3.❑	4.❑	5.❑	6.❑
b. On roads **outside** town or village	1.❑	2.❑	3.❑	4.❑	5.❑	6.❑

39. Why do you turn on your lights?
(You may circle more than one answer.)
   1. Because it is a habit
   2. It is the law
   3. Because I do not want to run the risk getting fined
   4. To be seen by other traffic users
   5. To have a better view of the road
   6. I never cycle in the dark
   7. Other ....
   8. I never have a light when I cycle in the dark

40. Why do you not turn on your lights in the dark?
(You may circle more than one answer.)
1. Dynamo has broken down
2. Light has broken down
3. I do not like cycling with the light on
4. I simply never have an accident
5. I never cycle in the dark
6. I do not have a light on my bike
7. For another reason, namely...
8. I always cycle in the dark with my light on

41. Do you think the chance you will be checked by the police for the traffic offenses mentioned below changed in 2001? **(Put an X in the box that best reflects your opinion.)**

		Increased	**Stayed the same**	**Decreased**
a.	Check whether people wear their safety belts	1.❑	2.❑	3.❑
b.	Check whether children are not safely transported in a car	1.❑	2.❑	3.❑
c.	Check on drunk driving	1.❑	2.❑	3.❑
d.	Check whether a helmet is not being worn	1.❑	2.❑	3.❑
e.	Check of speeding on a motorway (120 or 100 km/hour)	1.❑	2.❑	3.❑
f.	Check of speeding on a continuous road outside a city or village (80 km/hour)	1.❑	2.❑	3.❑
g.	Check of speeding on a rural road (60 km/hour)	1.❑	2.❑	3.❑
h.	Check of speeding on a continuous road within city or village (50 km/hour)	1.❑	2.❑	3.❑
i.	Check of speeding on a road in a residential area (30 km/hour area)	1.❑	2.❑	3.❑
j.	Check on driving through a red light	1.❑	2.❑	3.❑
k.	Check on driving too close to vehicle in front	1.❑	2.❑	3.❑
l.	Check on unnecessary driving in the left lane	1.❑	2.❑	3.❑

42. Whose name is on the registration paper of your car?
1. Private individual
2. Enterprise
3. I drive a motorbike only. **(Continue with question 44.)**
4. I did not drive a car in 2001. **(Continue with question 59.)**

43. Is it a leased car?
1. Yes
2. No

44. Please specify as accurately as possible how many kilometers you drove in the past year in a car or on a motorbike.

a. Car: .... kilometers in 2001
b. Motorbike: .... kilometers in 2001

45. How are these kilometers divided over the intended uses described below?

	Car	Motorbike
a. Transport home-work (from home to work and back)	....	..........km/year
b. Business purposes (official trips within the framework of my work)	....	..........km/year
c. Private purposes (for instance visits to family, groceries, and such things)	....	..........km/year
d. Holiday(s)	....	..........km/year
e. I do not know	....	..........km/year

46. How many kilometers did you drive abroad?
    a. Car: .... kilometers in 2001
    b. Motor bike: .... kilometers in 2001

47. Do you ever transport young children in the car?
    1. Yes, only my only children
    2. Yes, only children of others
    3. Yes, both my own children also children of others
    4. No **(Continue with question 49.)**

48. For children of up to 11 years old that you sometimes transport in the car, please circle what age category they belong in and how you usually transport them. When it involves more than three children, mention only the three youngest.

		Transport in the car	
Child	**Age**	**Front**	**Back**
1.	**Child 1** 1. 0 years 2. 1 to 2 years 3. 3 to 4 years 4. 5 to 11 years	**Child 1** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the front	**Child 1** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the back
2.	**Child 2** 1. 0 years 2. 1 to 2 years 3. 3 to 4 years 4. 5 to 11 years	**Child 2** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the front	**Child 2** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the back
3.	**Child 3** 1. 0 years 2. 1 to 2 years 3. 3 to 4 years 4. 5 to 11 years	**Child 3** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the front	**Child 3** 1. Free 2. On a lap 3. Carry cot 4. Baby seat 5. Child safety seat 6. Raised seat and belt 7. Only safety belt 8. Never in the back

If you drove both a car and a motorbike in the past year, please fill in the questions as a driver of a car. If you drove a motorbike only, you may answer the questions as a motorbike driver.

49. How fast do you drive on the following types of roads when there is not too much traffic, when it is good weather, or when there is a clear view and you are not passing other cars at that moment?

a. Motorway (120 km/hour speed limit) .... km/hour
b. Motorway (100 km/hour speed limit) .... km/hour
c. Motorway (100 km/hour speed limit) .... km/hour
d. Free road outside city or village (80 km/hour speed limit) .... km/hour
e. Rural road outside town or village (60 km/hour speed limit) .... km/hour
f. Free road inside town or village (50 km/hour speed limit) .... km/hour
g. Road in a residential area (30 km/hour speed limit) .... km/hour
h. Residential area (with restrictions to slow down traffic and 15 km/hour speed limit) .... km/hour

50. As a driver of a car/motorbike, why do you conform to the speed limit? **(You may mark more than one answer in every situation—A, B, C and D.)**

		A. Residential areas in city or village (max. 30 km/hr)	**B. Continuous road in city or village (max. 50 km/hr)**	**C. Outside city or village (max. 60 or 80 km/hr)**	**D. Motorway (max. 100 or 120 km/hr)**
1.	It is the law	1.❑	1.❑	1.❑	1.❑
2.	For safety reasons	2.❑	2.❑	2.❑	2.❑
3.	Because of the environment	3.❑	3.❑	3.❑	3.❑
4.	You run the risk of getting fined	4.❑	4.❑	4.❑	4.❑
5.	Because of the cost of fuel	5.❑	5.❑	5.❑	5.❑
6.	No hurry	6.❑	6.❑	6.❑	6.❑
7.	Otherwise, namely:	7............	7................	7.............	7..........
8.	I do not watch the limit and I simply do not conform to it	8.❑	8.❑	8.❑	8.❑

51. As a driver of a car/motorbike, why do you drive faster than the official speed limit? **(You may mark more than one answer in every situation—A, B, C and D.)**

		A. Residential areas in city or village (max. 30 km/hr)	B. Continuous roads in city or village (max. 50 km/hr)	C. Outside city or village (max. 60 or 80 km/hr)	D. Motorway (max. 100 or 120 km/hr)
1.	Because I am in a hurry	1.❑	1.❑	1.❑	1.❑
2.	It is fun/nice	2.❑	2.❑	2.❑	2.❑
3.	From boredom	3.❑	3.❑	3.❑	3.❑
4.	Adapting to others	4.❑	4.❑	4.❑	4.❑
5.	No real reason (I do not pay attention to it)	5.❑	5.❑	5.❑	5.❑
6.	Other	6. ………………..	6. ………………..	6. ……………….	6. ……………
7.	I never or hardly ever drive faster than the limit	7.❑	7.❑	7.❑	7.❑

52. How much alcohol do you consume when you drive by yourself home in a car/motorbike? For instance, at a party or a night with friends?
1. 7 glasses or more
2. 5 or 6 glasses
3. 3 or 4 glasses
4. 2 glasses
5. 1 glass
6. Nothing

53. How do you get home after consuming three or more alcoholic beverages? **(You may circle more than one answer.)**
1. By walking
2. By bike or moped, and I drive myself
3. By bike or moped, but someone else is driving
4. By bus, tram, train, subway, or taxi
5. By car/motorbike, but someone else is driving
6. By car/motorbike, and I drive myself
7. If it is possible, I will stay the night there
8. Other ....
9. I never drink three or more alcoholic beverages

54. Why do you not consume more than one alcoholic beverage as a car owner? **(You may circle more than one answer.)**
1. Because I find driving under influence of alcohol dangerous
2. Because it is the law
3. Because of the chance I will get fined
4. Because alcohol makes me sleepy
5. Because my partner, family, or friends like to see it that way
6. Because of habit
7. Other……………………………….
8. Because I do not like and/or use alcohol
9. I drive when I have drunk more than two alcoholic beverages

55. Can you imagine situations in which you would drink three or more alcoholic beverages and drive home by car/bike?
    1. Yes
    2. No **(Continue with question 57.)**

56. Why would that happen? **(You may circle more than one answer.)**
    1. Because I find driving under the influence of alcohol not dangerous
    2. Because it does not influence my driving skills
    3. Because I do not think it appropriate and sound not to drink alcohol
    4. Because my friends do it too
    5. Because everyone does it
    6. Because it is a habit
    7. Because I do not have a choice. I drink and still have to drive home.
    8. Other.......................................

57. Do you sometimes use prescribed drugs when you have to drive a car/motorbike? **(You may circle more than one answer.)**
    1. Light pain killer (available without prescription through the drugstore and the pharmacy)
    2. Heavy painkiller (available only through a prescription)
    3. Sleeping pill
    4. Sedative
    5. Antidepressant
    6. Antihistamine (against hay fever)
    7. Medicines against epileptic fits
    8. Other medicine……………..…
    9. No, never

58. Do you sometimes use drugs when you have to drive a car/motorbike? **(You may circle more than one answer)**
    1. Soft drugs (hash or marijuana)
    2. Heroin
    3. Cocaine
    4. Ecstasy
    5. Amphetamine
    6. LSD
    7. Other drugs, namely ………………
    8. No, never

59. How often did you fasten your seatbelt in the latest 10 drives **within** and **outside** a town or village?

	Latest 10 drives as driver	Latest 10 drives as front passenger	Latest 10 drives as back passenger
a. **Within** town or village	.... times	.... times	.... times
b. **Outside** town or village	.... times	.... times	.... times

60. Is it necessary for traffic safety to wear a seatbelt in the car? **(Put an X in the box that best reflects your opinion.)**

	Yes, is always necessary	**Yes, is only necessary above 10 km/hr**	**Yes, is only necessary above 50 km/hr**	**No, is not necessary**	**No, is not even dangerous**
a. As a driver	1.❑	2.❑	3.❑	4.❑	5.❑
b. As a passenger	1.❑	2.❑	3.❑	4.❑	5.❑
c. As back passenger	1.❑	2.❑	3.❑	4.❑	5.❑

61. Why do you fasten your seatbelt?
(You may circle several answers in every situation—A, B, and C.)

A. Driver
1. It is a habit
2. It is the law
3. Risk of being fined
4. It is safer
5. Because partner, friends and/or family want it
6. Other, namely ....
7. I never wear a safety belt
8. I never drive a car

B. Front passenger
1. It is a habit
2. It is the law
3. Risk of being fined
4. It is safer
5. Because partner, friends and/or family want it
6. Other, namely ....
7. I never wear a safety belt
8. I never sit in the front

C. Back passenger
1. It is a habit
2. It is the law
3. Risk of being fined
4. It is safer
5. Because partner, friends and/or family want it
6. other, namely ....
7. I never wear a safety belt
8. I never sit in the back

62. Why do you not use a seatbelt?
(You may circle several answers in every situation—A, B, and C.)

A. Driver
1. I simply forget
2. Seatbelt is uncomfortable
3. When there is an accident the belt is no use anyway
4. When there is an accident the belt does more harm than good
5. When driving along water the belt is dangerous
6. With short drives (5 to 10 minutes) the belt is not necessary
7. Not necessary because of airbag
8. Other, namely ....
9. I always wear the belt
10. I never drive a car

B. Front passenger
1. I simply forget
2. Safety belt is uncomfortable
3. When there is an accident the belt is no use anyway
4. When there is an accident the belt does more harm than good
5. When driving along water the belt is dangerous
6. With short drives (5 to 10 minutes) the belt is not necessary
7. Not necessary because of airbag
8. Other, namely..................
9. I always wear the belt
10. I never sit in the front

C. Back passenger
1. I simply forget
2. Safety belt is uncomfortable
3. When there is an accident the belt is no use anyway
4. When there is an accident the belt does more harm than good
5. When driving along water the belt is dangerous
6. With short drives (5 to 10 minutes) the belt is not necessary
7. Not necessary because of airbag
8. Other, namely..................
9. I always wear the belt
10. I never sit in the back
11. Car has no belt in the back

The next four questions are about using your phone while driving. With these questions the terms "hands-free" and "hand-held" cell phone are used. By hands-free cell phone, we mean a cell phone that is not necessarily held in the hand during a conversation. For this reason, both hands can hold the wheel. A hand-held cell phone must be held during a conversation.

63. Do you ever use a hand-held cell phone while driving a car?
    1. Often
    2. Sometimes
    3. Never
    4. I did not drive a car in 2001. **(Continue with question 69.)**
    5. In 2001 I drove a motorbike only. **(Continue with question 67.)**

64. Do you have a hands-free cell phone in your car?
    1. Yes **(Continue with question 65.)**
    2. No **(Continue with question 66.)**

65. How often do you use a hands-free cell phone while driving?
    1. Often **(Continue with question 67.)**
    2. Sometimes **(Continue with question 67.)**
    3. Never **(Continue with question 67.)**

66. Why do you not have a hands-free cell phone in your car? **(You may circle more than one answer.)**
    1. Too expensive
    2. Calling hands free is not safer than calling with a hand-held cell phone
    3. I only call in a traffic queue or when the car is not moving
    4. I have not decided about installing a hands-free cell phone
    5. I never call in the car

There is a lot of road rage. What this means is that the behavior of some drivers is threatening. Below we would like to ask you a couple of questions about that kind of behavior, whether you have been confronted with this, and whether you act that way sometimes too.

67. How often are you confronted with the behavior noted below while driving?

	Often	Fre-quently	Some-times	Never	Are you annoyed because of this behavior?
a. Drivers who honk to indicate that you have to hurry or move to the side	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion
b. Drivers who flash their lights to indicate that you have to hurry or move to the side	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion
c. People who indicate by swearing or obscene gestures that you "are not doing it right"	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion
d. Tailgaters	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion
e. Drivers who cut you off (just before you want to get back to the lane that you were driving)	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion
f. Physical violence (beating or kicking or steering to hit you with the car)	1.❑	2.❑	3.❑	4.❑	yes/no/no opinion

68. How often you behave that way?

	Often	Fre-quently	Sometimes	Never
a. Honking to indicate that others have to hurry or move to the side	1.❑	2.❑	3.❑	4.❑
b. Flashing the lights to indicate that others have to hurry or move to the side	1.❑	2.❑	3.❑	4.❑
b. Drivers who flash their lights to indicate that you have to hurry or move to the side	1.❑	2.❑	3.❑	4.❑
c. People who indicate by swearing or obscene gestures that you "are not doing it right"	1.❑	2.❑	3.❑	4.❑
d. Tailgaters	1.❑	2.❑	3.❑	4.❑
e. Drivers who cut you off (just before you want to get back to the lane that you were driving)	1.❑	2.❑	3.❑	4.❑

69. How dangerous do you find the following behavior? **(Put an X in the box that best reflects your opinion.)**

Do you find it dangerous if…	**Very danger-ous**	**Dangerous**	**Not dangerous**
a. People on the motorway drive faster than the speed limit	1.❑	2.❑	3.❑
b. People drive faster than the speed limit on continuous roads **outside** a town or village	1.❑	2.❑	3.❑
c. People drive faster than the speed limit on continuous roads **within** a town or village	1.❑	2.❑	3.❑
d. Before driving the driver drinks more than 2 beverages	1.❑	2.❑	3.❑
e. Before driving drugs or medicine are used	1.❑	2.❑	3.❑
f. In the front of the car a seatbelt is never used	1.❑	2.❑	3.❑
g. In the back of the car a seatbelt is never used	1.❑	2.❑	3.❑
h. People run red lights	1.❑	2.❑	3.❑
i. People using a cell phone in the car use a hand-held cell phone	1.❑	2.❑	3.❑
j. People using a cell phone in the car use a hands-free cell phone	1.❑	2.❑	3.❑
k. People do other things while driving like tuning the radio, changing a CD, and so on	1.❑	2.❑	3.❑

Opinion about measures

70. Below is a list of measures to improve traffic safety. This concerns measures that are already practiced, measures that will be practiced in the future, and ideas about measures.

Are you for or against the measures to improve traffic safety noted below? **(Put an X in the box that best reflects your opinion.)**

	For	**Against**	**Do not know/no opinion**
a. Mopeds should ride on the lane in the buildup area	1.❑	2.❑	3.❑
b. Cyclists coming from the right side have priority on crossings without signs and lights	1.❑	2.❑	3.❑
c. Moped drivers should take a theoretical exam before they are allowed to drive a moped	1.❑	2.❑	3.❑
d. Forbidding telephoning in a car with a hands-free cell phone	1.❑	2.❑	3.❑
e. When you have just passed your exam, you should get a beginner's license. With this you have to be monitored in the first couple of years.	1.❑	2.❑	3.❑
f. Obligatory that trucks have systems that shorten the blind corner of the drivers	1.❑	2.❑	3.❑
g. Obligatory practical exam for drivers of mopeds	1.❑	2.❑	3.❑
h. Obligatory to use a helmet when you ride on a bike	1.❑	2.❑	3.❑
i. Obligatory to use a helmet when you drive a motor-assisted bicycle	1.❑	2.❑	3.❑
j. Obligatory speed limits in personal cars	1.❑	2.❑	3.❑
k. Obligatory devices in cars that make it impossible to drive too near the car in front	1.❑	2.❑	3.❑
l. Increasing the minimum age at which you are allowed to drive a moped	1.❑	2.❑	3.❑
m. Increasing of the minimum age at which you are allowed to drive a car	1.❑	2.❑	3.❑
n. Obligatory courses for drivers of motor vehicles who have broken the rules severely	1.❑	2.❑	3.❑
o. More stringent examination of older drivers of motor vehicles	1.❑	2.❑	3.❑
p. More electronic checking (for instance, speed traps and red light cameras)	1.❑	2.❑	3.❑
q. More and more stringent checking of driving under the influence of alcohol	1.❑	2.❑	3.❑
r. More information from the government about what the traffic rules are	1.❑	2.❑	3.❑
s. More advertising information from the government, geared at influencing of behavior in traffic (for instance, trying to get fewer people to drive under the influence of alcohol)	1.❑	2.❑	3.❑
t. Decreasing velocity at crossings with thresholds and platforms	1.❑	2.❑	3.❑
u. Replacing intersections with roundabouts	1.❑	2.❑	3.❑
v. Decrease velocity at a pedestrian crossing with a traffic threshold	1.❑	2.❑	3.❑

	For	Against	Do not know/ no opinion
w. More areas in cities where you are allowed to drive more than 30 km/hour	1.❑	2.❑	3.❑
x. More rural areas where you are not allowed to drive more than 60 km/hour	1.❑	2.❑	3.❑
y. Divide lanes of 80 km/hour roads, so passing is not possible	1.❑	2.❑	3.❑
z. A system where you get penalty points for traffic offenses. When you pass a certain threshold, you lose your license.	1.❑	2.❑	3.❑
aa. To decrease the limit of the blood alcohol content limit from 0.5% to 0.2%	1.❑	2.❑	3.❑

71. Are you willing to discuss some points in this survey with one of our employees?
    1. Yes **(Fill in your name and address below.)**
    2. No

Name: ………………………………………………

Address: ………………………………………………

ZIP Code and place: ………………………………………………

It has been a long survey and we thank you for your cooperation. If you have any remarks, please write them below:

………

………

………

Do not forget to fill in your name and address below if you want a chance to win one of the 100 gift vouchers.

Name: ………………………………………………

Address: ………………………………………………

ZIP Code and place: ………………………………………………