OLDER ROAD USERS

THE INTERNATIONAL TECHNOLOGY SCANNING PROGRAM
SUMMARY REPORT

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SUMMARY REPORT

In March 2008, a team of nine transportation safety, traffic engineering, and human factors experts from the United States (U.S.) visited Australia and Japan to assess and evaluate infrastructure improvements designed to aid older road users. The scan tour members sought policy options and initiatives regarding transportation system planning, operations, and design as they relate to older road users. The group met with state and federal government transportation officials, University research centers, and staff from motorist's clubs and other non-governmental organizations interested in the mobility of older people. While the focus of the scan was on infrastructure improvements, the team also learned about new policies for older road user training, assessment, and licensing. In addition, general road safety programs were discussed with all agencies visited. The majority of these programs provided a benefit to older road users although they may not have been designed specifically with this user-group in mind. The converse of this is true as well; programs and policies developed for older road user safety and mobility will improve transportation for all users. The information obtained during the trip identified several planning, design, and operational changes which could be implemented in the U.S. to improve the mobility and safety of older road users.

Background

The Federal Highway Administration's (FHWA) Office of International Programs focuses on meeting the growing demands of its partners at the federal, state, and local levels for access to information on state-of-the-art technology and the best practices used worldwide. As part of this Office, the Technology Exchange Program accesses and evaluates innovative foreign technologies and practices that could significantly benefit U.S. highway transportation systems (*1*). The main avenue for accessing foreign innovations is the International Technology Scanning Program. The program is undertaken jointly with AASHTO and its Special Committee on International Activity Coordination in cooperation with the Transportation Research Board's NCHRP Project 20-36 on "Highway Research and Technology – International Information Sharing," the private sector, and academia.

The Older Road User (ORU) trip began its planning effort in September 2007 with the completion of a desk scan that recommended Australia and Japan as the two countries to visit during the trip. The initial team meeting occurred in October 2007 in Washington, D.C., and the trip took place February 28 – March 16, 2008.

Purpose

By the year 2020, there will be over 50 million Americans age 65 and older and by the year 2050 there will be roughly 80 million adults in this age category (2). It is well established that age-related declines in vision, cognition, and physical abilities will affect how ORUs drive and how they use other transportation modes. As former U. S. Secretary of Transportation Norman Mineta wrote in a Public Roads editorial, "Without additional attention to the needs of older citizens, the United States faces critical national impacts not only in terms of transportation safety, but also for the independence and mobility of the senior population. The specialized needs of older road and transit users will place new demands and strains on America's transportation system" (*3*). Engineering-based countermeasures are being developed and implemented here and abroad to minimize the impact of these ability changes.

FHWA has a multitude of programs that are devoted to the integration of ORU needs involving the

full spectrum of transportation systems (*4*). However, the focus of this scan tour was on the implementation of infrastructure improvements for older road users. Many countries, including the United States and Australia, have published documents detailing how the physical, perceptual, and cognitive changes associated with aging affect a person's ability to use the existing transportation system (*5,6)*. These documents include recommendations for improvements to infrastructure and operations to address the needs of older road users, but few have reported on the successful implementation of these recommendations.

The scan tour group also investigated policy initiatives regarding transportation system planning, operations, and design as they relate to older road users. The role of older road users in road safety programming, funding, prioritization and evaluation were also discussed with all of the governmental agencies. The scope of this project specifically excluded driver licensing and remedial training programs; however, the team took the opportunity afforded by the trip to learn about innovative policies in these areas currently taking place in Australia. As a recent GAO report notes, knowledge sharing between the U.S. and other countries can help the U.S. prepare for the coming increase in the proportion of older road users as the baby boom demographic bubble moves toward retirement in coming years (*2*).

Scan Team Members

The nine members of the team included transportation agency personnel from four states, University researchers, an association of Metropolitan Planning Organizations (MPOs), and the Federal Highway Administration. The team members were:

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Figure 1. ORU Scan Team in Tokyo, Japan (L-R Warhoftig, Chrysler, Granda, Hutton, Smith, DePue, Glassman, Alicandri, Harkey).

Issues of Interest

The purpose of this scan is to collect information from abroad with the potential to improve roadway safety and mobility for older road users in the United States. Improvements made to benefit this user group will result in safety and mobility benefits for the general population. Major issues of interest included the following:

- Infrastructure-based international best practices that improve safety and mobility for older road users that could be applied in the near term on US roadways.
- Policy approaches to improving infrastructure to better meet the needs and capabilities of older road users.
- Transportation planning policy initiatives to address mobility of older citizens in terms of land-use, transit, and other alternatives to driving.
- Policy approaches to improving older driver assessment, licensing, and training.
- Safety research collaboration opportunities between international and U.S. transportation research centers.
- Ways to improve US and international practices for long-term transportation planning for older road users.

To help the host countries address the team's concerns, a set of amplifying questions was provided to the hosts several months prior to the trip. A complete list of these questions will be included in the full report.

Travel Itinerary

During the two-week trip, the team visited representatives in two countries: Australia and Japan. The team visited three states in Australia: New South Wales, Victoria, and Queensland and the capital city, Tokyo, in Japan. The itinerary is listed below:

2 March	Sydney, New South Wales, Australia: Team Meeting
3-4 March	Sydney, New South Wales, Australia: Meetings with Hosts
5-7 March	Melbourne, Victoria, Australia: Meetings with Hosts
8 March	Travel Day
9 March	Brisbane, Queensland, Australia: Team Meeting
10-11 March	Brisbane, Queensland, Australia: Meetings with Hosts
12 March	Travel Day
13-14 March	Tokyo, Japan: Meetings with Hosts
15 March	Tokyo, Japan:: Team Meeting
16 March	Return to U.S.

Host Delegations

During the two-week trip, the team members met with representatives from the various national and regional transportation agencies in the host countries. A complete list of individuals with whom the team met and contact information for those individuals will be provided in the full report.

Summary of Findings

Throughout the presentations and discussions with the host countries it was clear that the graying of the post-World War II baby-boom generation is not a demographic phenomenon limited to the United States. In Japan, the rate of growth in the proportion of population over age 65 is much higher than US. By 2030, 30% will be over 65 compared to 20% in US (*7,8*). In Australia in the year 2030, demographers predict that 21.5% of the population will be over the age of 65 (*9*).

A Systems Approach to Safety

One overarching principle found in both countries was a focus on the frailty of older road users. Nearly all of the agencies visited had a general aim of keeping older people in vehicles as long as possible to prevent them from moving to a much more vulnerable class of road user – pedestrian. This guiding principle could be viewed as being at odds with concerns about the risk older drivers pose to themselves and other road users of all ages due to diminishing perceptual, physical, and cognitive abilities. In many sessions, however, our hosts presented the argument that the risk of injury and death for older road users is much greater as a pedestrian than it is as the operator or passenger of a vehicle. For this reason, there are public health benefits to keeping older people driving as long as they are safely able to do so. This attitude leads to programs to aid drivers, their families, and medi-

cal professionals to assess fitness to drive and policies that favor license limitations based on driving needs and ability prior to complete license revocation. A lack of transit alternatives and capacity will additionally cause people to stay in their cars longer.

Another implication of this focus on frailty is an emphasis on reducing crash severity, not just crash frequency. The performance metrics used by all of the agencies in Australia combine fatal and severe injury crashes into a single "road tolls" category. These agencies recognize that reducing severity includes changes to vehicle and roadside safety, in addition to roadway design and operations. The main operational change used to reduce crash severity is to lower vehicle speeds. Reducing speed differentially benefits older road users due to their frailty. Throughout Australia there was a general focus on speed reduction to improve outcomes for both vehicle-vehicle crashes and vehicle-pedestrian crashes. Both New South Wales and Victoria use automated speed enforcement (i.e. speed cameras) widely in an effort to curtail speed-related injuries (see Figure 2). In addition to automated enforcement, legislatively mandated speed limits are imposed in areas with high pedestrian traffic. These include schools, shopping districts, and entertainment precincts (see Figure 3). Reducing speeds also allows more time for older drivers and pedestrians to react to events which is important given the overall trend toward slower response times with aging.

A theme running through each of the individual Australian states' road safety programs was that fragility means that focusing exclusively on driver and pedestrian behavior misses the point; you need to focus on vehicle safety and roadside safety as well. Road users will continue to make errors, the focus of road safety systematic programs should be to minimize the consequences of those errors. One example of this systems approach is a current evaluation of vehicle crashworthiness standards in the state of Victoria and a consideration of parameters specific to older occupant injury classes

Figure 2. Automated speed enforcement warning sign in Sydney, Australia.

Figure 3. Reduced speed zone in high-pedestrian traffic area in Brisbane, Australia. Similar speed zones exist in other Australian states for shopping districts and school zones.

An offshoot of this systems approach is a belief that engineering solutions hold more promise than education for improving safety. This tenet was expressed at every agency and University visited in Australia. Research at Queensland University of Technology showed that errors made by older drivers in at-fault crashes were errors in judgment, not errors of risk estimation as seen with younger drivers. Engineering solutions to common errors of older road users include protected-turn phases at signalized intersections and curbside fencing to route pedestrians to actuated mid-block crosswalks. What these engineering treatments have in common is that they remove the go/no-go decision from the driver or pedestrian. The infrastructure tells the user when it is safe to proceed into a dangerous conflict point, such as an intersection.

Both countries used research, conducted in their own countries or abroad, to support their policy decisions. The research was often used to quantify the safety or mobility benefit of a program or policy. The implementing agencies then calculated the costs associated with the programs and used this benefit cost ratio to set priorities and policy. All agencies visited also used the research as support against political or popular pressure to change policies and practices.

Infrastructure Changes to Improve Older Road User Safety

Both countries presented further examples of infrastructure improvements aimed specifically at pedestrians. These changes would especially benefit older pedestrians because of their large over-representation in severe injury and fatal crashes involving a motor vehicle and a pedestrian.

In Japan, a strong theme driving many changes to infrastructure is the physical separation of pedestrians, bicyclists, and motor vehicles. This is being accomplished through sidewalk widening, dedicated barrier-separated bicycle facilities, and pedestrian grade separation at busy intersections (either overpasses or tunnels). Figure 4 shows the street level entrance to an underground pedestrian tunnel

under a busy urban intersection in Tokyo. Even where barrier-separated bicycle lanes cannot be built, traffic control devices encourage separate travelways for these modes (see Figure 5, the text in the foregraound reads STOP and the text within the lane lines reads BICYCLE). These separations provide an added measure of protection from vehicles for vulnerable road users. In addition, Japanese officials reported some injury incidents of collisions between bicyclists and pedestrians. The separation of bicyle and pedestrian facilities will aid in reducing those risks as well.

Figure 4. Underground pedestrian walkway under a busy urban intersection in Tokyo.

Figure 5. A crosswalk in Tokyo with separate lanes for bicycles and pedestrians.

In Australia, pedestrians were also the focus of many infrastructure improvements. It should be emphasized that these improvements aid all pedestrians, not just older persons, by providing better visibility of the crosswalk to approaching vehicles. Figure 6 shows a raised crosswalk with curb extensions in Sydney. This design shortens the walking distance for pedestrians and thus shortens their exposure time to traffic. The curb extensions also serve to bring the pedestrian closer to the travelway making the waiting pedestrian more visible to approaching motorists. Figure 7 shows a shopping area which uses curbside fencing and landscaping to channelize pedestrians to the crosswalks. The median island "gates" also improve the conspicuity of the crosswalk to approaching vehicles. Another example of pedestrian fencing is shown in Figure 8. Melbourne also uses pedestrian-actuated pedestrian signals at mid-block crossings in high pedestrian traffic areas.

Figure 6. Raised cross-walk with curb extensions kin Sydney, Australia.

Figure 7. A pedestrian crossing with refuge islands and gates in Sydney, Australia.

Figure 8. Mid-block pedestrian actuated crossing with pedestrian fencing in Melbourne, Australia.

Another area of infrastructure improvements aimed at older road users seen in Australia were changes to roadway and roadside design criteria. Examples from geometric design were adjustments to intersection angle and merge lane length that would differentially aid older drivers by reducing the amount of head turning needed to navigate intersections and merge areas. The slowing response times of older drivers were reflected in allowing longer perception reaction times in formulas for intersection sight distance and stopping sight distance. Many of the adjustments to these parameters were adapted from the FHWA *Older Driver Highway Design Handbook* (*6*),

Policy and Partnerships

In both countries, it was clear that safety needs to be a consideration at the highest forms of government and at the local level as well. The long-term strategic road safety plans adopted by each Australian state had champions in the federal parliament and relevant ministry offices. It is interesting to note that the states' strategic safety plans prioritized older road user issues differently based on their own states crash data. To complement high-level safety champions, local government has a primary role in improving infrastructure, providing services, and approving land use plans as they relate to older road users. In the state of Victoria, some local government units have full-time road safety staff who work in conjunction with their counterparts in the state department of transportation district office.

Another form of partnership was seen within the state road agencies themselves in their focus on cross-disciplinary and cross-agency working teams. In some states, the vehicle safety crashworthiness and vehicle inspection units were within the state DOT. There were recent cases of mergers and separations of departments of transportation, departments of motor vehicles, and departments of public safety within each state visited. Even in those states where the functions were separate,

road safety teams included members from licensing and law enforcement in addition to transportation engineering.

Health service providers and health insurers also were partners in road safety activities. Overall, Australian education efforts regarding older drivers emphasized physical fitness and how this affects ability to drive. The focus on physical fitness also has implications for pedestrians' ability to climb on and off transit vehicles, to cross the street within timed walk phases, and to avoid slip and fall hazards throughout the roadway environment. The health care providers' main effort seemed to be to lessen the suddenness of the transition from driving to non-driving. Programs were in place to train home health care workers to provide information about mobility options for those people who had ceased driving due to age-related illnesses or decline. Transportation safety education programs were tailored specifically for older road users with respect for their experience and judgement.

In Australia, another major partner was motoring clubs. The equivalent to the American Automobile Association (AAA), these clubs, unique to each state, played a particularly large role in road safety planning and evaluation. They provided tools for their older members for self-assessment and remedial training. In addition, the organizations were advocates in Parliament for fair licensing policies and medical review evaluation procedures. These organizations have produced excellent public information materials which could be adapted for similar programs in the U.S.

The last example of an innovative partnership is found with retirement planners and pension fund administrators. These groups are beginning to encourage their clients to include planning for transportation needs as part of normal retirement planning. In the course of discussions regarding goals for retirement activities, it would be natural to discuss transportation needs and options.

Future Trends

Roadway Design Criteria Flexibility

A particularly interesting new development in roadway design standards was discussed at Queensland Main Roads. The Extended Design Domain concept allows roads to meet different minimum design criteria as long as there is no known negative safety record. This flexibility in design criteria allow rehabilitation improvements to be made without the necessity of bringing the entire roadway up to current design standards. It should be noted that if the roadway serves areas of high use by older road users, as determined by local authorities, then these extended design criteria cannot be applied and the road must meet the highest current standards.

Other examples of flexibility in roadway design were present in many of the urban areas. The pedestrian treatments discussed earlier were applied in locations judged by local engineers to be high pedestrian traffic areas. In other cases, countermeasures were installed based on crash history. The system –wide transit boarding area improvements were being phased in were right-of-way allowed. In some cases, traffic lane shifts and parking restriction changes were necessary to accommodate the wider boarding areas.

Societal Change Toward Aging in Place

As both lifespans and health care costs increase, the trend in the U.S. and the countries visited is toward aging in place. This means providing goods and services to individuals in their own homes as long as possible. This trend away from traditional "old age homes" has several implications for transportation. One not so obvious effect is an increase in delivery services for such items as gro-

ceries and medicines. Indeed, some transportation counseling programs for older persons which were presented in Australia include training on how to obtain delivery of items in order to reduce the need to drive or use on-demand transit services.

The other, more obvious effect of aging in place is the sustained emphasis on personal vehicles as the primary mode of transport for elderly people – either as drivers or as passengers. Hand in hand with this is a growing need for transit services accessible to older road users. Some cities, such as Melbourne, are making improvements to transit infrastructure to enable easy boarding and transferring for elderly and disabled riders. The transfer station located in the median of a suburban arterial street shown in Figure 9 allows tram riders to exit the tram at the end of the line and board local busses without crossing the street. In general, in both countries the Scan Tour team felt that the low level of para-transit services was comparable to the U.S. This was particularly true in rural areas. Both Japan and Australia have laws equivalent to the American with Disabilities Act, but it seemed that these laws had not been in place for as long as in the U.S.

Figure 9. Tram - bus transfer station in Melbourne.

Changes in Modes of Transport: Mobility Scooters, Motorcycles, and Recreational Vehicles

Both countries discussed the rising number of mobility scooters used by older people as a form of transportation, often operating them in the vehicle travelways. There was no clear consensus as to what should be done in terms of licensing, training, or enforcement. Infrastructure changes may be needed to accommodate these machines as well. Some agencies are providing public education materials to guide the selection of scooters and offer tips for safe operation. In Japan, mobility scooters are welcomed by some in the aged services community who view them as a promising alternative form of transportation . They allow individuals to retain personal mobility which is important for mental health and high quality of life.

Figure 10. An older shopper using a mobility scooter in Tokyo, Japan.

In Australia, as in the U.S. there is a rising number of older motorcyclists. The largest single motorcycle club in Australia is the Ulysses club which is open only to members over the age of 50. Many of these motorcyclists are new riders or have not ridden in many years. Motorcycles today are much more powerful than 25 years ago, and a new "old" rider may not be ready for the new machines. Some agencies are considering changes to training and licensing laws to accommodate these returning motorcyclists who may have kept their license current for 30 years but haven't owned a motorcycle since they were in their teens. Again, older motorcyclists fragility and physical strength limitations pose a particular risk for injury.

The last trend on the horizon in Australia is an increase in recreational vehicle ownership among older people – the so-called "Greying Nomads". As in the U.S., retiring baby-boomers are buying motorhomes and camping trailers and going on extended driving trips. In Australia these trips pose a particular hazard because of the poor quality roads in much of the interior of the country. In addition, these remote roads are used by long-haul tractor-trailers who may be towing up to 4 trailers (called "Road Trains"). Changes to paved surface widths, turn radii, passing lane length, and other infrastructure elements may be needed to accommodate this increase.

Materials for Durable Colored Pavement

In both countries, the Scan Team noticed the frequent use of colored pavements for a variety of purposes. Australia used red color to prohibit normal vehicular traffic from bus and taxi lanes (see Figure 11) and green color to emphasize bicycle lanes in high hazard areas (Figure 12). Japan was experimenting with colored pavement to mark high-hazard horizontal curves and also as a tool for positive guidance and lane assignment through complex intersections. This could be particularly advantageous to older drivers. Australia reported some recent developments in materials which allowed durable color and sufficient pavement friction so as not to pose a safety hazard to pedestrians and cyclists.

Figure 11. Red-colored pavement used to mark a bus queue-jump lane at a signalized intersection in Melbourne, Australia.

Figure 12. Green-colored pavement used to highlight a bicycle lane as it crosses through an unsignalized intersection in Sydney, Australia.

Implementation Strategies

The scan team firmly believes that much can be gained in the U.S. by implementing the systems approach to safety and in promoting innovative partnerships as seen in the countries visited.. To that end, the scan team plans a number of technical presentations and written papers at national meetings and conference sponsored by FHWA, AASHTO, and other organizations to disseminate information from the scan. The team has also formed a subgroup to draft the Scan Implementation Plan for the initiatives and strategies described above. The Scan Implementation Plan will be finalized prior to the completion of the final report.

The success of this international scan can be measured by the number of ideas brought back to the U.S. and translated into strategies that will improve safety and mobility for older road users. Provided below is the initial list of strategies developed from the knowledge acquired on this scan and believed to be the most critical for making progress in the U.S. These strategies while aimed at older persons will serve to improve safety for all road users.

Enhancement of U.S. Roadway Design and Operations Practice – Integrate the knowledge of infrastructure improvements from Australia and Japan into relevant U.S. documents (e.g., FHWA Highway Design Handbook for Older Drivers and Pedestrians) and training programs.

Outreach to Non-Government Organizations – Further the development of partnerships between government agencies, such as departments of transportation and health, and between government and non-government organizations (e.g., AARP and AAA) to address the needs of older road users. Joint activities may include driver training and self-assessment programs, visual screening, pairing of transport planning with retirement planning, and development of educational materials on a variety of mobility topics. These same outreach

Targeted Research Program – Develop a research program on policies and interventions targeted at older road users. The scope of program should cover evaluation of specific interventions aimed at improving safety and mobility for older road users, development of new procedures and tools to aid practitioners in making decisions, and sharing of information on best practices through synthesis documents and professional conferences.

Establish Development Guidelines – Develop planning and land development guidelines for congregate housing and related transportation facilities and services that are intended to meet the growing needs older populations and older road users. The guidelines would be developed to assist local governments and the development community in the planning and retrofitting of existing facilities, as well as to assist local governments in their evaluation of land development proposals as it relates to older populations and older road users. The proposal could become a joint venture research project to be cooperatively developed by national transportation and land development organizations.

Professional Training for Alternative Transportation Providers – Develop training materials for professionals engaged in the business of providing alternative means of transport (e.g., transit, taxis, etc.) to educate them on the needs and capabilities of the elderly. Work with government and industry partners (e.g., FTA and APTA) to disseminate these materials within the profession.

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