The International Technology Scanning Program

INTERNATIONAL SCAN SUMMARY REPORT ON PEDESTRIAN AND BICYCLIST SAFETY AND MOBILITY

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Pedestrian and Bicyclist Safety and Mobility International Scan Team

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INTRODUCTION

In May 2009, a team of 12 transportation professionals with expertise in bicycling and walking from the United States (U.S.) visited five countries in Europe (Table 1) to identify and assess effective approaches to improve pedestrian and bicyclist safety and mobility. The countries identified in Table 1 were chosen because of their innovative approaches to nonmotorized transportation, as well as the potential transferability of their policies and practices. Some, like Denmark, had experienced an increase in car use in the 1960s and 1970s, and subsequently reoriented their transportation policy to give priority to bicycling and walking. The scan team heard presentations from and had informal discussions with the foreign hosts. During most visits, the scan team also went on guided field visits (by bike as well as by foot) to better understand and experience the design and operation of various walking and bicycling facilities. These field visits were invaluable in documenting the facilities through photos and video, observing traffic behavior, and experiencing firsthand how well a design or operational strategy worked.

Table 1. Hosted Locations for the Pedestrian and Bicyclist Safety and Mobility Scan Tour

Countries Visited	Localities Visited
Sweden	Lund and Malmö
Denmark	Copenhagen and Nakskov
Germany	Berlin and Potsdam
Switzerland	Bern and Winterthur
United Kingdom	London and Bristol

The purpose of this scan tour was to identify and assess effective approaches to improve pedestrian and bicyclist safety and mobility. The specific topics of interest were:

- **Improving Pedestrian and Bicyclist Safety:** Approaches (engineering, education, enforcement, and policy) that have been successful in improving pedestrian and bicyclist safety.
- **Safe Routes to School Programs:** Approaches and policies for improving safety for child pedestrians and bicyclists, especially those that support programs like "Safe Routes to School."
- **Monitoring Usage Levels and Exposure:** Quantitative methods of monitoring pedestrian and bicyclist usage levels (for example, counts and surveys) and exposure to crashes.
- **Safety Research and Evaluation:** Recently completed or ongoing research and collaboration opportunities in pedestrian and bicyclist safety.

The scan team identified numerous possible approaches to improving pedestrian and bicyclist safety and mobility in the U.S. The scan team also prepared a list of implementation items for those approaches that should be pursued in the U.S. This summary report provides a quick-response overview of the team's findings and recommendations.

SUMMARY OF FINDINGS AND CONCLUSIONS

The scan team gathered a considerable amount of information regarding various strategies and approaches that could be used to improve pedestrian and bicyclist safety and mobility in the U.S. This section highlights the most important findings from the scan tour. The findings are separated into *General Findings and Conclusions* and *Key Findings*. The *General Findings and Conclusions* section describes the broader issues and themes that emerged on the scan and provides a context for understanding the details provided in later sections of the report. The *Key Findings* section provides details on specific topics and is organized around the 5E approach (an expanded version of the 3E approach commonly used in traffic safety improvements):

- **Engineering** – designing and building infrastructure that is safe, convenient, and comfortable to use
- **Education** – educating all transportation system users on safe and appropriate behavior
- **Enforcement** – enforcing existing traffic laws
- **Encouragement** – encouraging and promoting the use of sustainable travel modes
- **Evaluation** – monitoring the results to ensure that goals are met

General Findings and Conclusions

- **Implementing foreign practices in the U.S. will require a careful, evidence-based approach.** Some policies, practices, and designs are easily transferrable and can be immediately implemented. For example, most enforcement, education, and encouragement programs could be quickly implemented without a thorough policy analysis or evaluation. Other policies or design practices will likely require a thorough safety evaluation. For example, separated bicycle facilities should be evaluated in the context of typical motorist and bicyclist behavior in the U.S. before being widely implemented here. Separated bicycle facilities may be quite effective in Denmark, for example, but their effectiveness in Denmark may be a product of the Danish culture and behavior or a result of their widespread implementation.

  However, foreign practices (like separated bicycle facilities) should not be dismissed outright simply because current American culture and behavior may be different. Culture and behavior can be changed, but these changes often occur over longer periods of time not covered in a typical safety evaluation. For example, separated bicycle facilities could be evaluated at a few trial locations in the U.S. and show no clear safety benefits in a typical one to two year safety evaluation. But in five to ten years, as more bicyclists use separated facilities and motorist and bicyclist behavior adapts, safety could improve dramatically. Unfortunately, this increase in safety would not be captured in typical safety evaluations because they do not capture long-term behavior changes. It should also be noted that many of the host countries have undergone a culture change within the past 40 years that has placed increased emphasis on walking and bicycling safety and mobility. Changes of this sort can happen if fostered by a careful, evidence-based approach.

- **Numerous factors contribute to higher rates of pedestrian and bicyclist safety improvements and higher walking and biking mode splits in the host countries.** From all of the information that the scan team gathered and everything they observed, it appears that higher rates of

- Overall urban and land use policy, parking and congestion pricing, and street planning and design;
- Political support from elected officials, government staff, and the general public;
- The high costs of owning and operating a private motor vehicle (gas, parking, licensing, etc.);
- A comprehensive, continuous, integrated approach that extends beyond pedestrian and bicyclist "treatments" to include elements such as:
    - Parking policies
    - Street design hierarchy that considers pedestrians and bicyclists first
    - Integration with and widespread availability of public transit
    - Connected on-street and off-street walking and biking networks
    - Ongoing promotional campaigns and activities
    - Traffic safety education for children throughout their school years;
    - Visually rich pedestrian-level built environment;
    - Routine photo enforcement; and,
    - Numerous other policy and facility details that make walking and bicycling easy, convenient, and enjoyable.

- **Many of the foreign hosts have established an urban street user hierarchy that gives the highest priority to walking, biking, and public transit.** The street user hierarchy has been developed to support a range of public policy goals, such as livability, sustainability, public health, climate change, and congestion management. The hierarchy guides decisions about transportation policy, planning, design, operations, and maintenance. For example, typical street design begins by first considering the space needs of pedestrians and bicyclists, rather than designating the motor vehicle space and then giving pedestrians and bicyclists the leftover space (if there is any). Another example from Sweden is their winter snow removal policy, which gives highest priority to the streets with transit routes or bicycling facilities.

- **"Safety in numbers" (also called "awareness in numbers") is a clear motivator behind the promotion of walking and bicycling as a safety improvement strategy.** Most of the host countries indicated that they promoted walking and bicycling for a variety of reasons (lower overall transportation delivery cost, sustainability, space and energy-efficient, health and wellness, etc.), and improved safety was often mentioned as one of the outcomes for higher levels of walking and biking. Their rationale, supported by international research studies (and recent U.S. data), is that, when pedestrians and bicyclists are a common element in the street environment, motorists will expect their presence and take the necessary precautions at potential conflict points, such as when a motorist turns right across a through bicycle lane. Anecdotally, the scan team routinely observed this type of motorist behavior during field visits, in which motorists were more aware of pedestrians and bicyclists at conflict points (Figure 1).

Figure 1. Motorist Waits for Through Bicyclists Before Turning Right Across Cycletrack (Copenhagen, Denmark)

Key Findings

Key Findings Related to Engineering

- **There was thoughtful consideration regarding a "false sense of security/safety" when designing pedestrian and bicyclist facilities.** This expression was mentioned numerous times by the engineers and planners responsible for facility design details. The host countries are not rashly constructing facilities in an effort to promote walking and bicycling without regard for safety. In fact, some of the host countries are paying meticulous attention to crash and injury data to determine which road designs are safest for pedestrians and bicyclists. For example, Sweden has implemented nationwide the STRADA (Swedish Traffic Accident Data Acquisition) database that integrates police crash data and hospital admissions data. The STRADA database addresses the underreporting problem that is common to walking and biking, and gives Swedish engineers and planners a more complete picture of walking and biking safety.

- **The scan team observed several innovative traffic signal features and design practices that have the potential to improve pedestrian safety in the U.S.** These include:
    - Passive detection of pedestrians in crosswalks to truncate, extend or cancel the pedestrian phase at traffic signals (Figure 2).
    - Near-side traffic signals that reduce motorist encroachment on the pedestrian crosswalk.

- Near-side pedestrian signal heads that encourage pedestrians to view oncoming traffic.
- Raised crosswalks at unsignalized pedestrian crossings (applied at midblock locations, roundabouts, entrances to traffic-calmed districts, etc.).
- Refuge islands, even if confined or limited space requires the use of smaller-sized refuge islands.
- Railing that is used to direct pedestrian movements to defined crossing locations.

Figure 2. Automated Pedestrian Sensors are Used to Adapt Signal Timing for Pedestrians (Bristol, United Kingdom)

- **The scan team observed several approaches and design practices that could be used to improve bicyclist safety in the U.S.** These include:
  - Approaches to address right turn crashes, such as advanced stop bars for bicyclists, "Trixi" (heated convex) mirrors (Figure 3) (or other specialized motor vehicle-based mirrors), bike boxes, leading green phase for bicyclists, and right-turn-on-red restrictions for motorists.
  - Separated facilities, such as cycle tracks, separated bike lanes, and shared use paths with delineated space for pedestrians and bicyclists.
  - Bicycle-specific traffic signals to reduce turning conflicts at signalized intersections.
  - Pavement markings, such as dashed bike lanes thru intersections, colored lanes at conflict points, and longitudinal bike symbols at driveways and stop-controlled cross streets (oriented to be seem by motorists turning across the bike lane).

Figure 3. Convex Mirrors Improve Bicyclist Visibility for Drivers of Large or High-Profile Vehicles (Bern, Switzerland)

- **The scan team observed the use of low-speed street designs in both residential and commercial areas that were especially conducive to walking and bicycling.** For example, the city of Bristol, England has implemented 20 mile per hour "home zones" in their new residential development. Several cities in Sweden, Germany, and Switzerland also have implemented low-speed streets (20 to 30 kilometers per hour) in both residential and commercial areas. However, several of the foreign hosts indicated that certain conditions must be met for these low-speed street designs to operate properly: 1) it should be used in "special places"; 2) speeds of the different modes should be similar; 3) flows (volumes) of users should be similar; and, 4) "see and be seen" is a critical design element.

- **The scan team observed close integration of bicycling and walking considerations with public transit (including intercity rail) that make longer intermodal commutes by bike practical as well as safer and more convenient.** These considerations include:
    - A variety of bike parking solutions at stations, including plentiful and convenient bike racks, covered outdoor parking, and secured indoor parking.
    - Policies that permit bikes on trains and buses, even during peak times.
    - Bike rental or sharing programs located in or very near train or bus stations.
    - Channels or ramps on stairways that make it easier to use steps while pushing a bike.
    - Public taxis with quick-mount bike racks for taxi passengers.

Key Findings Related to Education

- **Many of the foreign hosts have pervasive and widespread traffic safety education programs for all children.** The education programs start at an early age and some continue through the teenage years. These traffic safety programs involve participation from a wide variety of organizations, including schools, businesses, civic organizations, police, public health groups, and parks and recreation departments. For example, several countries had a "children's traffic club" program that provided ongoing, age-appropriate safety material to parents and children, as well as fun learning activities. The city of Winterthur, Switzerland uses a "traffic garden" (a landscaped, reduced-scale closed course that includes traffic signals, roundabouts, bike lanes at intersections, sidewalks, work zones, public benches, and other common traffic situations) to teach elementary-age children to ride bikes safely in traffic (Figure 4).

Figure 4. Aerial View of Reduced-Scale Closed Course for Traffic Safety Education for Children (Winterthur, Switzerland)

- **Bicycle helmet use is encouraged but not required by law.** The scan team found higher levels of helmet use than expected in the countries visited. Helmets were uniformly encouraged for children and were encouraged for adults where crash data indicated that wearing a helmet would improve safety. Most countries placed an emphasis on physical activity first and helmets second. Their rationale was that required helmet use discourages bicycling (physical activity), which could have a greater public health detriment than head injuries due to crashes.

Key Findings Related to Enforcement

- **The scan team observed the widespread use of photo enforcement for traffic signals and speed limits.** Although photo enforcement is viewed primarily as a tool for improving motor vehicle safety, better motorist compliance with speed limits and traffic signals also improves pedestrian and bicyclist safety.

Key Findings Related to Encouragement

- **Many of the foreign hosts use promotional programs and activities to encourage and enable more walking and biking.** These "encouragement" activities are seen as a tool to meet their modal share goals as well as increase pedestrian and bicyclist safety. Many of the foreign hosts viewed higher levels of walking and biking as a way to improve safety (the "safety in numbers" effect). Where walking and bicycling are considered "the norm," a certain amount of encouragement happens inherently, by example. Common examples of promotional programs and activities include:
    - Well-marked routes with way finding signs and printed maps;
    - Web-based biking and walking route planning and maps, including extensive countryside pathways inviting tourists and other occasional users;
    - Shared bike programs for public agencies, private companies, or the general public;
    - Free or very low cost public-use bicycles;
    - Routine provision of quality bike racks at convenient locations;
    - Employer-sponsored programs (bike-to-work incentives);
    - Marketing campaigns to reduce or shift short car trips (Figure 5);
    - Public health-sponsored wellness and physical activity programs; and,
    - Personalized travel planning.

Figure 5. Promotional Banners to Reduce "Ridiculously Short" Car Trips (Malmö, Sweden)

Key Findings Related to Evaluation (Monitoring)

- **Many of the foreign hosts provide regular performance reports on pedestrian and bicyclist safety and mobility**. These performance reports measure the agency's progress toward stated goals and outcomes, and are used to refine policies and strategies to ensure that goals are met. For example, the city of Copenhagen publishes a "Bicycle Account" every two years that reports on several measures such as cyclist mode split, safety, and perceived comfort and safety. The most common pedestrian and bicyclist performance measures were usage (e.g., counts, mode share) and safety (e.g., fatalities and serious injuries), which were typically reported on an annual basis.

- **Several cities provided a "showcase" counter in a highly visible location to demonstrate daily and annual bicycle use.** Although this tool was noted to yield varying and, in some cases, inaccurate results, it was a point of pride and a reminder that what gets counted counts.

RECOMMENDED IMPLEMENTATION ACTIONS

The key findings were used by the scan team in developing the recommended implementation actions, which are summarized in this section.

Policy

- **Encourage transportation policy (national, state, and local level) that addresses the safety and mobility of biking/walking/non-motorized modes, such that these modes shall be given highest priority in the road user hierarchy.** This hierarchy, when integrated with public transit, simultaneously addresses numerous other public policy goals, such as livability, sustainability, public health, climate change, and congestion management. To implement this policy, establish specific and measurable outcomes with performance targets, including usage and safety experience (see the *Evaluation* recommendation later in this section).

Engineering

- **Evaluate and consider implementation of innovative signal features and geometric designs to improve pedestrian safety at street crossings.** Examples of these features are discussed in the *Key Findings Related to Engineering* section.

- **Evaluate and consider implementation of innovative strategies to improve bicyclist safety.** Examples of these strategies are discussed in the *Key Findings Related to Engineering* section.

- **Evaluate the applicability of lower-speed street designs in residential and commercial zones.** The evaluation should address the differences in application between residential and commercial areas, and should more clearly define criteria for the use of low-speed street design in the U.S.

- **Develop guidance on best practices for integrating bicycle and pedestrian considerations into public transit, including inter-city rail.** These considerations include permitted times of bike boarding, bike parking, bikes on trains and buses, and bike sharing (e.g., city bike) programs.

Education

- **Institutionalize ongoing traffic safety education starting at an early age including knowledge and skill-based learning.** The safety education programs can be multi-faceted and include a variety of agencies and organizations for optimal delivery.

- **Unify all traffic safety campaigns (including bicycle and pedestrian safety) under a single national brand.** For example, the United Kingdom's Department for Transport has developed a road safety program called "THINK!" that includes educational materials for numerous safety focus areas.

Enforcement

- **Promote the use of photo enforcement as a tool to improve pedestrian and bicyclist safety.**

Encouragement

- **Develop and implement programs that encourage and enable regular walking and biking.** Examples of these strategies are discussed in the *Key Findings Related to Encouragement* section.

Evaluation

- **Develop and implement a performance monitoring and reporting program that regularly (annual basis) measures progress toward stated goals/outcomes.** Key performance measures are usage and safety experience. National guidance should be given on a consistent format and a sampling strategy to develop national estimates. Additionally, FHWA's 1994 National Bicycling and Walking Study should be updated to reflect current conditions and renew or reestablish national goals for bicycling and walking safety and usage.

NEXT STEPS

As evidenced in this Summary Report, the scan team identified numerous approaches in the host countries for improving walking and biking safety and mobility that merit consideration here in the U.S. The next critical step in FHWA's International Technology Scanning Program is the implementation phase, which has already begun. The members of this scan team will communicate the key findings, promote implementation ideas, and help to advance the adoption of the approaches and practices described in this report. Ultimately, though, the scan team will rely on "champions" from numerous agencies, organizations, and groups in the U.S. to put into practice these policies and approaches that will ultimately to help increase safety and mobility for walking and bicycling.