SEPTEMBER–OCTOBER 2002
NUMBER 222

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

TR NEWS

Working on the Railroad

Getting Passenger Services Up to Speed

- Pioneering in the Pacific Northwest
- California's Rail 'Megaproject'
- Answering Florida's Popular Mandate
- Connecting Tracks to Runways
- Reinventing National Passenger Rail
- Minimizing High-Speed Wear-and-Tear

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

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Working on the Railroad: Getting Passenger Services Up to Speed

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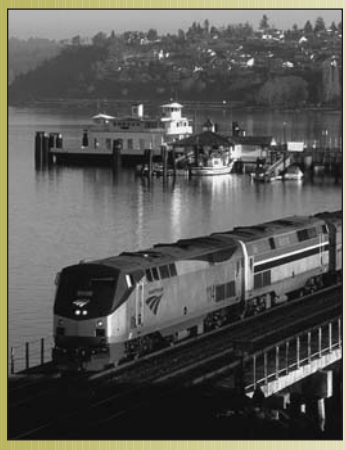

Cover: Amtrak's *Coast Starlight* passes Steilacoom, Washington, over an inlet of Puget Sound, on the way to Los Angeles. (*Photo by Steven J. Brown*)

TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

***TR News* is produced by the Transportation Research Board Publications Office**
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TR News (ISSN 0738-6826) is issued bimonthly by the Transportation Research Board, National Research Council, 500 Fifth Street, NW, Washington, DC 20001. Internet address: www.TRB.org.

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Subscriptions: North America: 1 year $55.00; single issue $9.50. Overseas: 1 year $70.00; single issue $13.00. Inquiries or communications concerning new subscriptions, subscription problems, or single-copy sales should be addressed to the Business Office at the address below, or telephone 202-334-3216, fax 202-334-2519. Second-class postage paid at Washington, DC.

Postmaster: Send changes of address to *TR News*, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001.

Introduction

Answering the "All Aboard" Call

Will Passenger Rail Survive and Succeed?

Passenger rail has been a mode of travel in the United States since the 1830s, and ridership on intercity passenger rail reached a high point in the late 1940s. Since then, the toll roads in the East and the Interstate Highway system, along with the proliferation of automobiles and the expansion of commercial aviation, have relegated passenger rail to the smallest share of the U.S. intercity travel market. The one exception is the Northeast Corridor between Washington, D.C., and Boston, Massachusetts—major federal capital investments and new passenger equipment have increased Amtrak's share of the travel market to exceed that of air transport.

Since the formation of Amtrak in 1971, U.S. passenger rail service has struggled to achieve the self-sufficiency demanded by Congress and by successive administrations. The trials and tribulations of Amtrak are now in their latest and perhaps final chapter with a cash-flow crisis that may shut down service, barring a last-minute bailout.

Despite this bleak picture, bright spots can be found around the country in programs developed cooperatively by Amtrak and states to improve intercity passenger rail services. This theme issue of *TR News* focuses on some of the success stories, explores restructuring options, presents a vision for integrating and coordinating rail and air services, and more.

Ron Sheck of the Washington State Department of Transportation discusses the success of the Pacific Northwest Rail Corridor, also known as the Cascade Corridor, serving the states of Washington and Oregon as well as the Canadian province of British Columbia. The new passenger equipment now in service has increased ridership with added frequency and capital improvements. The long-range plan, which Sheck describes, envisions expanded intercity service, as well as new commuter rail in the Seattle and Tacoma, Washington, areas.

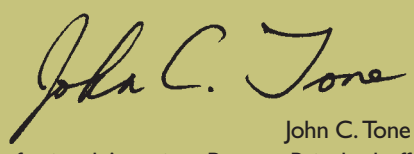
In one of the most ambitious programs for intercity passenger rail, California is completing engineering and environmental studies for a 700-mile high-speed rail system connecting San Francisco, Sacramento, Los Angeles, and San Diego. Albert Witzig of DMJM+Harris discusses the details of this $25 billion project. He points out that passenger rail is an additional, valuable tool for meeting mobility needs in a state that has recognized new freeways are not the answer. In a sidebar article, Dan Leavitt, Deputy Director of the California High-Speed Rail Authority, reviews the environmental process and the steps in selecting a preferred alignment.

On the other coast, Nazih Haddad, Staff Director of the Florida High-Speed Rail Authority, outlines Florida's historic constitutional amendment endorsed by voters and the subsequent legislative and implementation actions that are moving the strategic planning forward.

In a Point of View column, Anthony Perl, Director of the Aviation Institute of York College, City University of New York, shares insights into some of the policy issues and challenges to the survival and success of passenger rail. He notes the need for clear definitions of the role of federal, state, and private enterprise in the future of the struggling mode. In a second Point of View, consultant George Haikalis examines the emerging role of intercity passenger rail in providing coordinated and interconnected service with air transportation, citing many of the successful air–rail interfaces in the United States.

In addition, John Harrison of Parsons Brinckerhoff reports highlights from a 2002 TRB workshop on improving the capacity of the rail corridors that serve both freight and passenger trains. Finally, in a special article in the ongoing "Research Pays Off" series, Allan M. Zarembski of ZETA-TECH Associates and John Bell of Parsons Transportation Group present solutions to the technical problem of limiting the effects of high-speed dynamic forces on track structure.

The articles resound with the "All aboard!" call at a critical juncture for passenger rail in the United States, pointing the way to passenger rail's survival and success.



John C. Tone
Senior Professional Associate, Parsons Brinckerhoff
Chair, TRB Committee on Intercity Rail Passenger Systems

EDITOR'S NOTE: Appreciation is expressed to Elaine King, Rail Transport Specialist, TRB, for her efforts in coordinating this issue of *TR News*.

Developing the Pacific Northwest Rail Corridor

Vision Gains Momentum Through Technology, Service, Partnerships

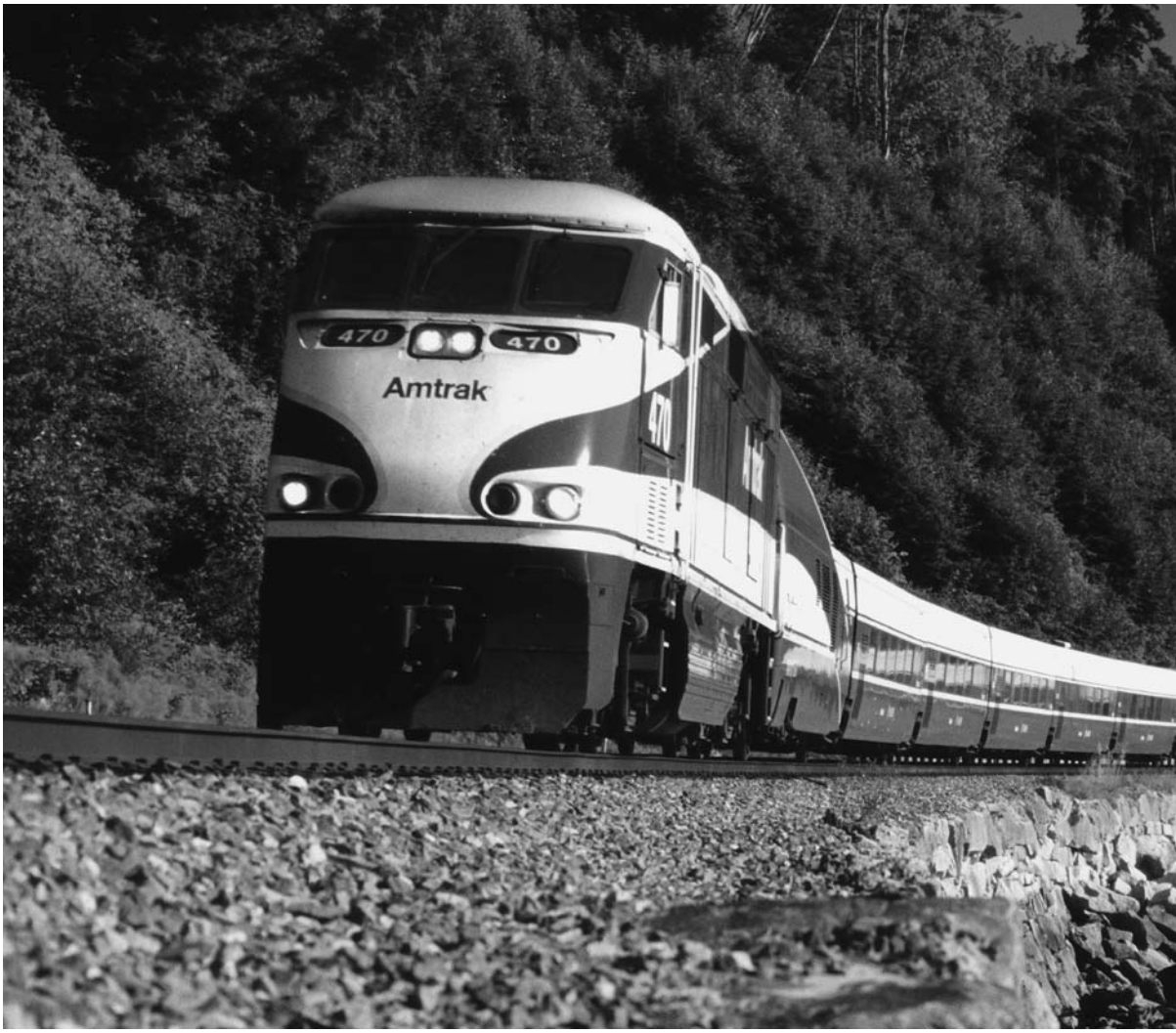
RONALD C. SHECK

The author is Commuter/Intercity Rail Coordinator, Public Transportation and Rail Division, Washington State Department of Transportation, Seattle. He is a member of the TRB Committees on Intercity Rail Passenger Systems, Commuter Rail Transportation, and Intermodal Transfer Facilities.

The 466-mile rail line between Eugene, Oregon, and Vancouver, British Columbia, has emerged as a major passenger corridor connecting the 7 million inhabitants of metropolitan areas, small cities, and rural hinterlands in Oregon, Washington, and British Columbia. The Pacific Northwest Rail Corridor—also known as the Cascade Corridor—has gained recognition for innovations in technology and passenger service. Customer-focused products have stimulated significant increases in ridership.

Sharing the Vision

The initial vision for the Seattle-Portland segment of the corridor developed from conversations between representatives of the Washington State Department of Transportation (DOT) and Oregon DOT. The staffers then convinced officials to take the risk of providing an alternative to the increasing congestion on Interstate 5, the principal north-south roadway that connects major urban centers in the two states. Rapid



Northbound *Cascades* train riding along the shores of Puget Sound, near Edmonds, Washington, en route to Vancouver, B.C. The low-slung, articulated train set, with locomotive at one end and cab car at the other, is bidirectional and does not have to turn around at terminals.

population growth in the past two decades had strained the Interstate's capacity and had increased travel time, costs, and social stress.

The transportation agencies proposed an incremental development of major railroad assets into a high-speed rail passenger service, starting with the Seattle-Portland route. The approach would invest in capacity for more frequent train service at higher speeds to reduce travel times. The vision was to

- Upgrade the rail lines for greater capacity and higher speeds;
- Improve grade-crossing safety;
- Rehabilitate and build stations;
- Increase train frequencies and reduce travel times;
- Introduce new passenger train technology, as well as onboard amenities emphasizing customer service; and
- Enhance intermodal connections to other intercity carriers and to local transit.

STEVEN J. BROWN

TABLE 1 Round-Trip Corridor Trains (per day)*

	1993	2002	2018
Seattle-Portland	1	3	13
Seattle–Vancouver, B.C.	0	2**	4
Portland-Eugene	0	2	5

* Does not include the *Coast Starlight*, Seattle–Los Angeles long-distance train.

** One train runs to Seattle-Bellingham only but will extend to Vancouver pending capital improvements in British Columbia.

TABLE 2 Corridor Travel Times (hours: minutes)

	1993	2002	2018
Seattle-Portland	3:55	3:30	2:30
Seattle–Vancouver, B.C.	N/A	3:55	2:57
Portland-Eugene	N/A	2:25	1:45

To realize the vision, Seattle-Portland service would have to reach 13 roundtrips per day by 2018 (Table 1), and travel time would have to be reduced from 4 to 2.5 hours (Table 2).

Partnerships and Studies

The vision also has involved developing partnerships with Amtrak, the railroads, and local communities. Coincident interests and an expanding and strengthening set of partnerships have extended the corridor south from Portland through Oregon's populous Willamette Valley to Eugene, and north from Seattle along Puget Sound to Vancouver, B.C. Adding to this international dimension, the routes have introduced European-designed train sets, to provide additional service for the growing ridership.

A new regional transit agency in the central Puget Sound area has added an overlay of commuter rail service. As the vision and the service areas expand, the complexities of financing and implementing services and programs increase.

In 1992, the Federal Railroad Administration included the Pacific Northwest Rail Corridor among five areas for the development of high-speed rail, and the Swift Rail Act of 1995 reconfirmed the designation. Studies in the early 1990s examined technical, economic, and environmental issues in the development of the corridor's three rail segments: Seattle-Portland, Seattle-Vancouver, and Portland-Eugene. The studies identified several public benefits:

- Travel by rail is more environment-friendly than automobile travel.
- Comprehensive, multimodal systems offer opportunities to combine the efficiency of mass transportation with individual convenience.
- Regional economies benefit from an improved transportation infrastructure.

Programs and Projects

The incremental approach has enhanced the assets of the railroad infrastructure through track and signal improvements, allowing additional capacity and higher speeds. Between Seattle and Portland, the Burlington Northern Santa Fe (BNSF) main line is double track. The BNSF Seattle-Vancouver route includes 30 miles of mostly double track immediately north of Seattle, with the rest single track. The Union Pacific (UP) line south of Portland to Eugene also is single track.

Planned track and signal improvements include crossovers and bidirectional signaling on double-track segments, additional passing sidings on single-track segments, and extension of centralized traffic control (CTC). South of Tacoma, Washington, a freight branch line will be upgraded for commuter services to provide an intercity bypass, trimming 15 minutes from the running time of Seattle-Portland passenger trains. South of Portland and north of Everett, Washington, sidings for additional passing on single-track segments will increase operating efficiency and reduce travel time.

Passenger Service Today

Rail passenger service in the corridor is dominated by short-distance intercity trains. This pattern has evolved since 1992, when Amtrak and Washington State DOT put the first European-designed Talgo trains into North American service between Seattle and Portland. Before 1992 service primarily consisted of long-distance trains between Los Angeles, Portland, and Seattle and between Chicago, Denver, Portland, and Seattle. Only one short-distance train operated in the Seattle-Portland corridor.

Gaining Speed

Two Talgo train sets leased from the Spanish manufacturer replaced a conventional Amtrak intercity train on the Seattle-Portland run and allowed restoration of passenger train service between Seattle and Vancouver in May 1995, after a 14-year hiatus. Public acceptance and favorable response to the European trains led Amtrak and Washington State DOT to purchase four newer-generation Talgo train sets (two each) in 1999. A fifth set is leased from the manufacturer.

With a lower center of gravity than traditional passenger equipment, the articulated train sets are able to take curves at a higher speed. The equipment has reduced travel time on the Seattle-Portland segment from 4 to 3.5 hours (Table 2). The Talgo trains are marketed as the Amtrak *Cascades*, under an agreement between Washington State DOT, Oregon DOT, and Amtrak and include 14 daily trains operating on different segments of the corridor (Table 3).

Washington State Department of Transportation

Cascades business-class cars, with two-plus-one seating, more legroom, electrical connections, and drop-down seat-back tables, have proved popular.

The Amtrak *Cascades* trains employ short (46-foot) cars, articulated with a single axle over the car joints. The trains offer coach (with two-plus-two seating) and business class (with two-plus-one seating). The consist includes a bistro food service car, a lounge car with table seating, and a baggage and a train utilities car, with a capacity of 235 seats in coach and 44 in business class.

The trains are powered by a diesel locomotive and operate in push-pull configuration with a locomotive at one end and a cab baggage car at the other. Although capable of speeds greater than 125 mph, the trains are limited to a maximum of 79 mph in the corridor until additional improvements to track and signal systems are completed.

Offering Amenities

Washington State DOT and Amtrak have collaborated in developing high-quality service focused on frequency, travel time, comfort, and safety. Amenities on the Amtrak *Cascades* were developed with consumer input and include a bistro car serving regional foods and beverages from a take-out counter, with table seating in an adjacent lounge car. The Seattle-Vancouver segment offers sit-down dining service and the Seattle-Portland-Eugene menu lists sandwiches, salads, soups, pasta bowls, breakfast pastries, and hot and cold beverages, including local beer and wine.

Movies are shown on overhead televisions, which also display Global Positioning System maps of the

TABLE 3 Amtrak *Cascades* Service to Pacific Northwest Corridor Segments, 2002

	Corridor Trains Each Way	Distance in Miles
Eugene-Portland	2	124
Portland-Seattle	3	186
Seattle-Bellingham	1	98
Seattle–Vancouver, B.C.	1	156

train's location, as well as travel and arrival time information. Seats have electrical outlets in coach and business class; family and business table seating is also available. Each train has onboard public telephones. Amtrak *Cascades* were the first trains in the Northwest to provide independent wheelchair access between cars.

Washington State Department of Transportation

Electrical connections and drop-down seatback tables enable travelers to use laptop computers and other devices while traveling on *Cascades* trains.

Customs and immigration for the international Amtrak *Cascades* are handled at Vancouver's Pacific Central Station for passengers arriving in Canada. Southbound passengers to the United States gain immigration clearance before boarding in Vancouver, and the train picks up U.S. Customs officials at Blaine, Washington (not a passenger stop), to complete inspection en route to Bellingham. However, demands on U.S. Customs resources after September 11, 2001, caused delays as southbound trains had to wait at Blaine for inspection.

Amtrak and the two state DOTs have marketed the Amtrak *Cascades* extensively, offering incentives for advance ticket purchase, as well as pricing to meet peak and off-peak demand. An award-winning advertising campaign has targeted automobile users by emphasizing comfort, convenience, and lack of stress, as well as the variety of onboard amenities.

Traveling Near or Far

Two long-distance trains incorporate the corridor into journeys from other states: the *Coast Starlight*, connecting Los Angeles and Seattle, and the *Empire Builder* from Chicago, which connects at both Seattle and Portland. The northern section of the *Empire Builder* follows the corridor's 30-mile Everett-Seattle segment into Seattle. Both long-distance trains employ bilevel Superliner equipment.

Washington State Department of Transportation

Video monitors on *Cascades* trains show movies and display travel information including train location and arrival times.

Commuter rail service entered the corridor in September 2000, when the Central Puget Sound Regional Transit Authority—known as Sound Transit—inaugurated two weekday roundtrip *Sounder* trains from Tacoma to Seattle. *Sounder* operates in a push-pull mode with bilevel Bombardier commuter cars and General Motors Electro-Motive Division locomotives.

The plan is for commuter rail trains to increase frequency between Seattle and Tacoma, with route extensions adding *Sounder* trains to Everett, north of Seattle. The Tacoma service will extend south to Lakewood on what is now a freight-only BNSF branch.

Making Connections

The 16 stations of the Pacific Northwest Rail Corridor have relied on a combination of state, Amtrak, railroad, and local funds for upgrades and improvements. Local community fund-raising efforts built the new Olympia-Lacey, Washington, station on a site purchased by the local transit agency. Volunteer staff open and maintain the building daily and provide information to travelers. The volunteers, however, do not sell tickets—passengers with reservations can use an automated ticket machine.

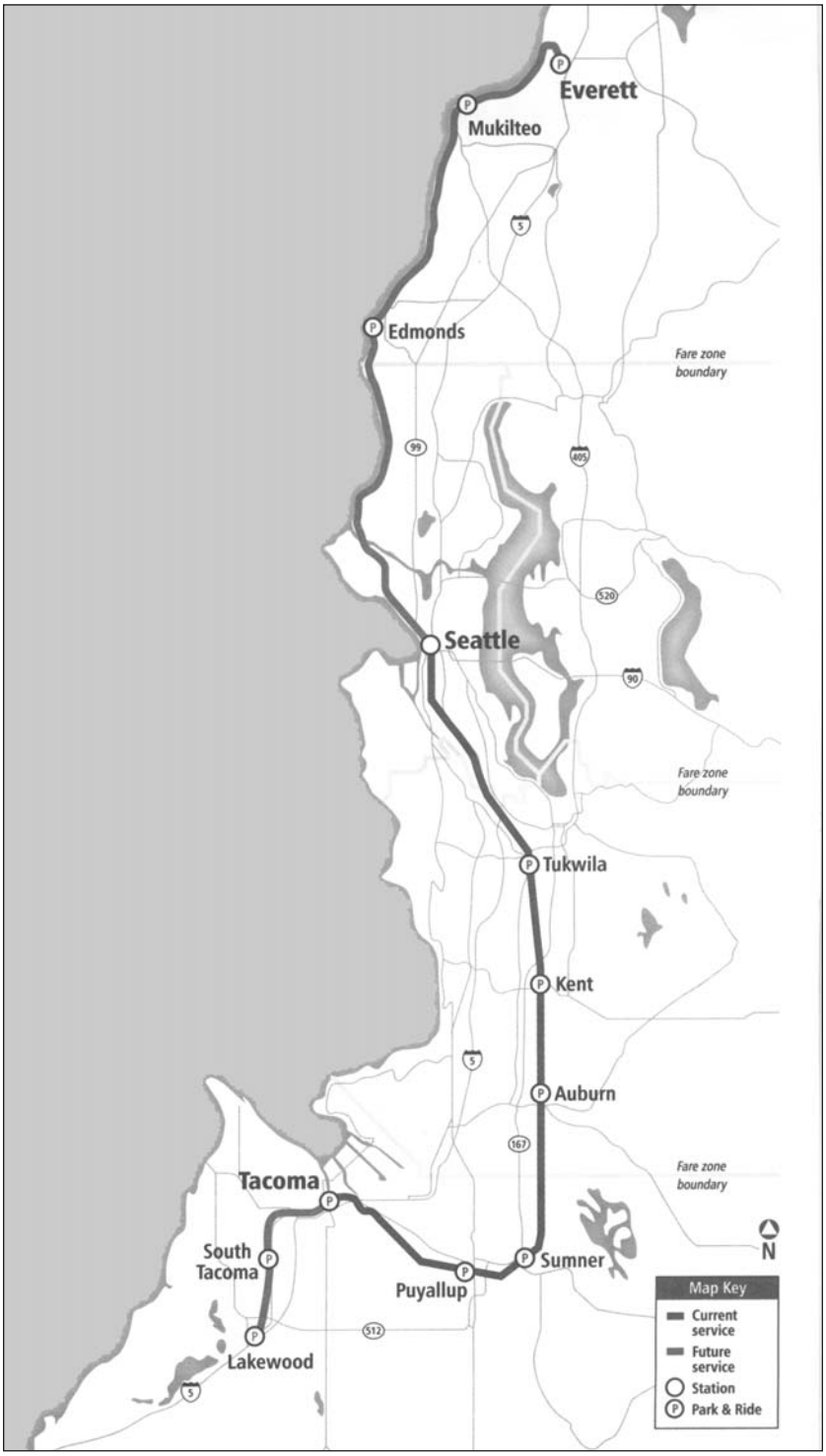
The station in Bellingham opened in 1996 in a rehabilitated former fish cannery, incorporated into a new multimodal transportation center that also serves intercity Greyhound buses, local transit, and the Alaska Marine Highway system. In Vancouver, the Amtrak *Cascades* shares the Pacific Central Station with Via Rail Canada, Greyhound, and Pacific Coach Lines.

An important adjunct to the corridor's rail program is the Amtrak *Thruway* bus service. In Washington, the Amtrak-funded *Thruway* buses connect areas between Seattle and Vancouver with Amtrak *Cascades* trains and with the long-distance *Coast Starlight* and *Empire Builder*. Oregon's state-supported *Thruway* bus network is more extensive, radiating from Portland and Eugene to connect Amtrak *Cascades* and the *Coast Starlight* with coastal, central, and southern Oregon communities.

Overlaying the System

Commuter Service

In 1996, when voters approved the creation of Sound Transit, they also endorsed a 10-year plan for the new authority to serve the urbanized portions of King, Pierce, and Snohomish counties with regional express bus, light rail, and commuter rail. The "Sound Move" plan also will establish commuter rail service sharing the BNSF main line with Amtrak intercity trains from



Washington State Department of Transportation

Sounder commuter trains will eventually link Everett, Seattle, Tacoma, and Lakewood—a total of 82 miles through three counties.

Everett through Seattle to Tacoma. *Sounder* commuter trains will extend from Tacoma to Lakewood on a BNSF freight line.

The *Sounder* program includes capital investments for additional track, signal, grade crossing, and station improvements on the 82 miles of rail line for commuter trains. Construction on the Seattle-Tacoma segment began in early 2000, and service debuted on September 20, 2000, with two roundtrips every weekday. Six commuter rail stations have been built on the route, with the station at Tukwila also serving as a stop for the Amtrak *Cascades*.

In Seattle, two tracks at King Street Station have been rebuilt for *Sounder* service. Track improvements between Seattle and Tacoma have focused on additional crossovers, installation of bidirectional CTC, grade-crossing fixes, a limited section of third main track, and rerouting of mainline track, in preparation for construction of a new Amtrak maintenance facility that also will service *Sounder* trains. Sound Transit has purchased 58 bilevel commuter cars and 11 locomotives for the *Sounder* service.

Extending *Sounder* service south of Tacoma to Lakewood involves rebuilding the BNSF freight branch that serves Ft. Lewis. *Sounder*'s new Tacoma Dome station—with a track configuration designed for future expansion, including intercity routes—eventually will handle 15 weekday roundtrips for Lakewood-Tacoma-Seattle and will become an Amtrak station.

North of Seattle, Sound Transit is negotiating capital and operating agreements with BNSF to allow six round trips for *Sounder* trains between Seattle and Everett. *Sounder* and Amtrak trains eventually will share five stations—Tacoma Dome, Tukwila, Seattle King Street, Edmonds, and Everett.

Multimodal Stations

Implementation of the planned capital and operating programs of Washington State DOT–Amtrak and Sound Transit in the 82-mile shared-use corridor requires considerable coordination and cooperation, as well as multimodal facilities. Amtrak trains will begin serving a new multimodal transportation center in Everett in late 2002.

Other multimodal centers with train, bus, and local transit service are being planned. Washington State DOT, Amtrak, and Sound Transit are exploring a joint-use facility at Tukwila to replace the temporary platforms erected for the *Sounder* start-up and now shared by Amtrak *Cascades*.

Seattle's King Street Station is undergoing a two-phase development to allow capacity for the planned build-out of *Sounder* and intercity trains. When current Washington State DOT–Amtrak and Sound Transit plans reach their goals, King Street Station will become the third busiest train station west of Chicago—after Los Angeles and San Jose, California.

Partnership Roles

The intercity rail passenger vision developed by Oregon, Washington, and Amtrak and the commuter rail vision developed by Sound Transit have

been translated into well-defined goals and objectives with detailed programs and projects. Fulfilling the visions and attaining the goals and objectives require partnerships.

Key to the intercity–commuter rail visions is the partnership with BNSF and UP. Freight trains and passenger trains must mix in a way beneficial to all. Public- and private-partner goals must be treated equally, and the resolution of any conflict over track capacity must be "win-win"—positive for both sides.

Potential partners and what they may offer include the following:

- Washington State DOT, Oregon DOT, and Sound Transit: rolling stock, motive power, and other assets; capital and operating assistance; and marketing, planning, and policy leadership.
- Amtrak: operation of intercity trains and stations, rolling stock, motive power, maintenance facilities, support services, marketing, planning, safety, and security.
- BNSF and UP: track, yards, stations, dispatching, track and signal maintenance, operation of commuter trains, safety, and security.
- Canadian National and Via Rail Canada: track, yards, and stations.
- Local governments: stations, parking lots, and local safety and security.
- Talgo: train sets, maintenance, safety, and security.
- Special authorities: station development—for example, the Portland Development Commission as owner and developer of Portland Union Station.
- Volunteers and advocacy groups: staffing—as at Olympia-Lacey station—and assistance in station design.
- Local transit agencies: connecting local transportation, sometimes to intercity routes.
- Greyhound and Pacific Northwest Trailways: connecting intercity bus services.
- Contract bus operators: additional *Thruway* bus services.
- Victoria Clipper: high-speed ferry service from Seattle to Victoria, B.C., and Washington State's San Juan Islands.
- Washington State Ferries: connecting ferry service at Seattle and Edmonds to points in Puget Sound.
- Alaska Marine Highway: connecting ferry service from Bellingham to southeast Alaska ports.

Building on Success

The intercity and commuter rail programs in the Pacific Northwest Rail Corridor have experienced early success. Amtrak *Cascades* and *Sounder* ridership have exceeded projections, setting new records. *Cascades* ridership grew from 180,000 in 1994, the first full year of operation, to 560,000 in 2001, and in mid-2002, the two weekday *Sounder* roundtrips averaged 650 riders per train.

Washington State Department of Transportation

Bilevel *Sounder* commuter train on Seattle-Tacoma route.

Key to continued ridership growth is faster, more frequent service with a strong on-time performance record. The Amtrak *Cascades* trains already have achieved these goals. Also contributing to the current success are the clean, comfortable, and safe trips. Onboard food and beverage quality, courteous and friendly crews, movies, real-time travel information, adequate seating, and flexibility to move around are other assets travelers have noted. Except for King Street in Seattle—scheduled for upgrading—the stations have received good ratings from travelers.

King Street Station, Seattle, will undergo renovation for redevelopment as multimodal facility serving 80 or more trains, intercity and local buses, light rail, streetcar, and monorail.

Innovative marketing and advertising strategies have helped. The states and Amtrak have offered discounts for advance ticket purchases and bistro-car coupons for business travelers, have conducted an award-winning highway billboard and bus-side poster campaign, and have done collaborative marketing for *Cascades* with the Victoria Clipper and a supermarket chain. *Sounder* has relied on similar media strategies and has promoted special trains to Seattle Mariners baseball and Seahawks football games—the football slogan is "More gridiron and less gridlock."

Another plus for many is the accessibility of transportation connections like *Thruway* or other intercity bus or ferry routes, or to local transit—particularly in Seattle, Portland, and Vancouver. In calendar year 2001, seating on more than 200 Amtrak *Cascades* trains was sold out.

Limited capacity, however, has stymied ridership growth on the *Sounder* commuter train. The two weekday round trips offer only a fixed number of seats. Adding trains must await agreements between Sound Transit and BNSF for track improvements.

Paying the Bill

Price Tags

Passenger rail service in the Pacific Northwest Rail Corridor represents a substantial financial commitment by Washington and Oregon, Amtrak, Sound Transit, BNSF, and UP. Planning studies by Oregon and Washington, British Columbia, and Amtrak, with the assistance of the freight railroads, have produced a 20-year, $1.9 billion investment package to benefit freight rail and commuter services as well as intercity passenger trains. Approximately 75 percent of the total investment—nearly $1.5 billion—directly or indirectly will support intercity passenger service, including corridor infrastructure improvements, train sets, land acquisition, and station upgrades.

Through 2001 the capital investment benefiting intercity passenger rail for the Pacific Northwest Rail Corridor has totaled $597 million, which includes $175 million from Washington State DOT, $27 million from Oregon DOT, $113 million from Amtrak, $43 million from federal sources, $225 million from BNSF, $11 million from UP, and $3 million from local communities. The BNSF expenditures include $200 million to reopen the Stampede Pass route, which has enhanced corridor capacity.

The original Sound Move plan authorized capital improvements totaling $669 million. By 2001 the *Sounder* budget had increased to $766 million, and the 2002 budget raised the capital investment to $885 million.

Work under way by the commuter rail agency on the Seattle-Tacoma segment of the corridor is budgeted at $512 million for track, signals, and stations. However, initial underestimates of the costs for track and facilities work and increased costs for environmental mitigation and meeting the demands of local communities for parking structures and other specifications at commuter rail stations have boosted the budget needs. Improvements for Everett-Seattle track, facilities, and station work will cost $132 million and for Tacoma-Lakewood, $94 million.

Budget Crunches

A few recent developments have dampened financial optimism for investments in Pacific Northwest Rail Corridor intercity and commuter rail. The Washington State Transportation Commission agreed in the mid-1990s to provide $106 million in partnership funding for the Tacoma-Everett segment developed with Sound Transit for commuter and intercity rail service. However, in 1999 Washington voters passed Initiative 695, eliminating the motor vehicle excise tax, a major source of transit and rail funding.

After Initiative 695, the Puget Sound Regional Council backfilled $60 million of the Tacoma-Seattle budget to replace a portion of the $106 million that was no longer available from Washington State DOT. The remaining $46 million shortfall will be made up from a $15 million state general fund appropriation for 2002–2003, plus $31 million in a revenue package that goes before state voters in November (Referendum 51).

The general economic downturn in Oregon and Washington has produced budget shortfalls affecting transportation investments at the state and regional levels. Both states have retained funds to operate the current level of Amtrak *Cascades* corridor services, but did not receive any new capital. Amtrak's financial crisis has reduced its capital program significantly. The construction of a major new maintenance facility in Seattle for intercity Amtrak and *Sounder* trains has been scaled back with a more than 60 percent reduction in available funds.

The long-term outlook nonetheless is favorable. Legislation introduced before the U.S. Congress would fund high-speed rail programs and Amtrak at higher levels than before. Washington State voters will choose a new transportation package in November that includes about $140 million in rail corridor capital over a 10-year period. A regional transportation funding package will appear on the ballot of three central Puget Sound counties in spring 2003 and probably will include local commuter rail capital needs, as well as station upgrades and expansions.

Persisting Priorities

Amtrak *Cascades* intercity and *Sounder* commuter trains have experienced success in terms of a key mea-

SOUND TRANSIT

Renovated station for commuter service in Auburn, Washington, includes parking garage and commercial development on the ground level. A pedestrian bridge will be added to parking garage to provide access to station platforms on opposite side of tracks.

sure of customer satisfaction, ridership growth. Continued growth—making a significant difference in travel options for the Pacific Northwest—requires further expansion of train service. The list of priorities to advance these Pacific Northwest Rail Corridor rail programs would include the following:

- New train sets for intercity Amtrak *Cascades* service;
- Track improvements to allow additional trains at higher speeds between Seattle and Portland;
- Completion of the planned build-out of the Amtrak maintenance facility in Seattle;
- Redevelopment of King Street Station in Seattle as a multimodal transportation center;
- Coordination and implementation of Washington State DOT and Sound Transit capital investment in the Everett-Seattle-Tacoma-Lakewood segment of the corridor;
- Track improvements between Portland and Eugene; and
- Track capacity improvements in British Columbia to allow up to four daily trains in both directions between Seattle and Vancouver.

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Answering the "All Aboard" Call

Keeping California Mobile with High-Speed Rail

Megaproject Arrives at Critical Stage

ALBERT C. WITZIG

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As California moves ahead with the planning and environmental analysis for a 700-mile high-speed rail (HSR) system to connect the San Francisco Bay Area and Sacramento with the Los Angeles Basin and San Diego, a recurrent doubt arises. Is the system too new for North America or too radical a departure from the traditional bimodal solutions of highways and airports? In addition, public discussion of the HSR system may be misled by traditional thinking about investments in an intercity transportation system dominated by highways and air traffic.

Earlier HSR projects along corridors in Texas, Florida, and other North American regions have foundered on what is perceived as the foreignness of the solution, as well as on an often checkered history of complicated planning, financing. and institutional arrangements. Nevertheless, the public is intrigued by the promise of faster travel times and more attractive travel conditions. In Florida, voters once again have directed the state to move forward with HSR. Many other states and regions are looking anew at their rail corridors.

California has arrived at the most advanced stage of HSR system planning. After several years of detailed planning and conceptual engineering, the California High-Speed Rail Authority, in cooperation with the Federal Railroad Administration, is introducing HSR to the public and to decision makers (see sidebar, page 14). The Authority is preparing an environmental impact analysis that (*a*) compares high-speed trains against the no-build and another multimodal alternative and (*b*) defines the preferred alignment and station locations.

HSR can be a viable addition to a multimodal transportation environment. The chronic transportation challenges that have emerged as California copes with population and economic growth are a long-range trend. The HSR system should not be considered a completely new mode but an increment to the intermodal transportation system.

But a comprehensive buy-in from voters and public leaders requires an understanding of the HSR system in terms of its unique technical characteristics, not in terms of local highways or the intrastate air system. An understanding of what HSR can and cannot accomplish by itself—and how HSR can be integrated into the state's transportation supply—will be invaluable. A viable HSR system must fit into—and not interfere with—the current system.

Lessons from Abroad

Discussions that compare foreign and U.S. HSR policies often fail to note that the radically new trains and tracks that captured the public imagination in Europe and Japan were incremental responses to travel demands that could not be accommodated any other way. As Anthony Perl notes in *New Departures*,[1] the high-profile HSR successes—the Japanese *Shinkansen*, the French *Train à Grande Vitesse* (TGV), and the German InterCity Express (ICE)—all started as responses to capacity constraints.

The *Shinkansen*, the earliest of the three, initiated 250-km/h (150-mph) service between Tokyo and Osaka in the mid-1960s. The new standard-gauge line replaced earlier narrow-gauge service, which was slower and offered less capacity, both in the number of trains and in the numbers of seats per train. The service already is near its scheduling capacity, and a magnetic levitation system is being tested on a new alignment in the Yamanashi segment, which will allow speeds of up to 500 km/h (300 mph). Developing an entirely new alignment for the maglev follows a strategy successfully employed in France in the 1980s.

The crowded Paris-Lyons line of the French National Railways would have required an expensive upgrade of intercity express, local, and suburban lines to increase capacity. The alternative was to build a new express-only alignment to relieve congestion and to separate capacity for high-speed and conventional rail.

Following a different route between the cities, the new line was built to a higher standard for gradients and curves, to accommodate the TGV speeds of 300 km/h (186 mph). The TGV service literally took off, opening a network of fast-track routes reaching Tours,

[1] Perl, A. *New Departures: Rethinking Rail Passenger Policy in the Twenty-First Century*. University Press of Kentucky, Lexington, 2002. (See Bookshelf section, page 40.)

Marseilles, and London, including partial high-speed service to other off-line destinations.

The German ICE has taken the most incremental approach to upgrades. Since Germany's major cities are decentralized, HSR segments were chosen primarily to relieve systemwide bottlenecks, not to improve travel times for a few city pairs. The first New Line, between Würzburg and Hannover, replaced small branches that formed a north–south route from Hamburg to Munich. The second New Line, constructed between Stuttgart and Mannheim, circumvented difficult geography to connect the Southwest to Frankfurt and its active airport.

Reunification has added pressure to reconnect the East and Berlin to the former western regions with upgraded, faster alignments. But another New Line, which opened in August between Cologne and Frankfurt, follows the French strategy, supplying a new short route with fast service to relieve the overcrowded rail corridors along the Rhine.

Integrating Modes

The common note in each of these examples is that the old lines were not abandoned. Instead, the new lines performed a new service and freed up the old lines for continued use.

The TGV largely has replaced air travel for the 500-km Paris-Lyons trip—the Lyons airport now features a TGV station. The corollary, however, is that market forces and regulation also have reassigned the air fleet either to longer routes—which aircraft can serve efficiently—or to destinations not on the TGV line.

Similarly, in California, an HSR system will not wipe out or diminish airline or long-distance freeway demand between the Bay Area and Southern California but instead will take up increments of demand that the constrained intrastate air and highway systems could not serve. An HSR system in California would be an intermodal expression of the European and Japanese rail system experience—a new alignment that allows the current infrastructure to continue useful service.

In this way, California HSR would not be a radical departure but a functional increment to the transportation options and capacity of the intermodal system. HSR would help to resolve the bottlenecks that plague the bimodal system—namely, the inability to expand airports and the inability to build new or wider freeways. HSR trains would provide relief at roughly double the speed of automobiles and half the speed of airplanes, freeing up the highway and air modes to perform at peak effectiveness.

HSR can provide service incrementally within the speed and capacity continuum of the transportation system. However, evaluating the HSR option requires more than the traditional techniques of transportation analysis.

RAFAL TOMASIK

Japan's *Shinkansen* T-5000 train set will serve expanding network of high-speed rail routes throughout the country (*top*).

Powered axles throughout Germany's InterCity Express train sets master grades of new Cologne-Rhein-Main route opened in 2002 (*center*).

France's *Train à Grande Vitesse* makes express-only trip on Paris-Lyons line, reducing congestion and travel times for passengers (*bottom*).

Megaproject Parallels

The $25 billion cost estimate puts the HSR system into the rarefied range of other Califronia megaprojects of the past 50 years—the freeway system, the state university system, and the water project. Each megaproject has constructed physical or institutional infrastructure that has changed the lives of all Californians.

The freeway and university systems depended on a master plan that could be implemented incrementally, route by route or campus by campus. The water project and the HSR proposal share a similarity—although both can be implemented in sections, the full impact stems from the comprehensive operation of the interlocking elements, so that the system effects of the whole exceed the sum of the parts.

The megaprojects required "thinking outside the box," because empirical measurements were impossible beforehand—only data on local impacts could be assembled and evaluated. Voters and officials therefore could consult only their vision, tempered by experience. The HSR system faces the same spectrum of strong opinions and solid concerns.

High-Speed Rail Authority Readies the Plan

DAN LEAVITT

The California High-Speed Rail Authority is responsible for planning, constructing, and operating a high-speed train system serving California's major metropolitan areas. With a nine-member policy board and a small core staff, the Authority contracts with private firms to perform the environmental, planning, and engineering work for the project.

The Authority has proposed construction of a high-speed train system to serve Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire (the region east of Los Angeles), Orange County, and San Diego. Trains capable of speeds exceeding 200 mph would complete the San Francisco–Los Angeles trip in 2.5 hours. The objective is to enhance the mobility of Californians to and from the major population centers through 2020 and beyond. The benefits of the system are expected to outweigh the costs.

The Authority has initiated the state and federal environmental review processes for the 700-mile high-speed train system, taking the lead on the state Environmental Impact Report (EIR), with the Federal Railroad Administration (FRA) filing the federally required Environmental Impact Statement (EIS). The Authority and FRA have completed a scoping process to evaluate options for routes and stations, as well as a screening process to reduce the number of alignments, station locations, and types of high-speed trains for further investigation.

The Authority is scheduled to release a draft program-level EIR-EIS document in June 2003, describing the preferred alignment and station locations for the system, allowing the preservation of rights-of-way, and enabling the development of a phased implementation program.

The public is providing input throughout the environmental review process. For more information, visit the Authority's website, www.cahighspeedrail.ca.gov/.

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Strategies for Mobility

The California Department of Finance projects a state population of approximately 45 million by 2020, an increase of more than 30 percent—another 11 million people and roughly another 10 million automobiles. The projection is for 60 million people by 2040. Where will these people live and work, and how will they move around?

Mark Pisano of the Southern California Association of Governments points out that mobility is the icon of freedom in California. Everyday mobility means access to homes, workplaces, shopping, and attractions—this has been the almost exclusive mandate of the automobile.

For intercity trips, the airplane has become a connector of regional highway networks. The travel pattern is to use cars to access airports as park-and-ride facilities. A car rental then provides a reverse park-and-ride at the destination. Airport authorities rely on parking and rental concessions for a significant portion of revenue. A parallel traffic flow of cars and trucks also can be found on the state's main trunk routes (I-5, US 101, SR 99)—the extra time required for driving is offset by the convenience of single-vehicle movements at both ends.

Defining Goals

The discussion about HSR in California is in its early stages. What should the system do and what may it be able to do? Already under consideration are four laudable but not fully focused goals for HSR:

- Relieve crowded highways and airports;
- Revitalize central cities;
- Provide safe, comfortable, reliable, and environmentally sustainable mobility between major cities and suburbanized regions, large and small; and
- Maintain and expand transportation system capacity while protecting resources and quality of life.

The HSR system should concentrate at first on resolving one part of the mobility dilemma: the need for capacity and frequency in intercity travel. HSR can relieve some of the pressure on short-haul air service within the state and, at the same time, on the north–south freeway connections.

HSR will provide more attractive and more frequent service among the major metropolitan areas of the state, but also to and from the smaller regions. The HSR system may bring about radical changes similar to those caused by the huge increase in telecommunications capacity—long-distance toll charges collapsed, as pricing was decoupled from the service's production costs.

Inland Links

Even before the September 11 attacks, air service to the Central Valley from Los Angeles and San Francisco International Airports ranged from flights with a total of less than 100 seats a day for Modesto and Visalia to hourly links with Fresno and a little more than hourly with Bakersfield. At the maximum, flights provided an average of less than a few hundred seats a day in each direction.

The HSR operating plan would run dozens of trains to link these inland centers to the north and the south. The smaller stations would receive at least a dozen trains daily. The biggest potential for changes in accessibility is the connection of the Central Valley with the Los Angeles Basin, overcoming the obstacle of the Tehachapi Range.

But access is only one issue for the Central Valley. The quality of development around the chosen station sites must be addressed. The occasion calls for a review of downtown economic development and for

reformulating the general planning assumptions of cities on the HSR line.

Some in the Central Valley perceive HSR as a threat to agricultural lands. Carefully locating the HSR right-of-way should minimize the impacts on agricultural operations and land.

Locating Stations

The HSR system is not a freeway, despite sharing some physical characteristics. The chief similarity is the isolation from other traffic through grade separations and separate rights-of-way. HSR, however, is narrower than a freeway—generally only two tracks wide—and requires less land. HSR grades are less steep than highway design standards, so that ramping up or down requires a longer distance. Throughout California, highways more often pass over or under railroads.

A major difference is that stations—the equivalent of interchanges—cannot be located at any point on the line. Stations catalyze growth and development along a rail line. Location and function within the railroad's operating plan strongly influence a station's impact.

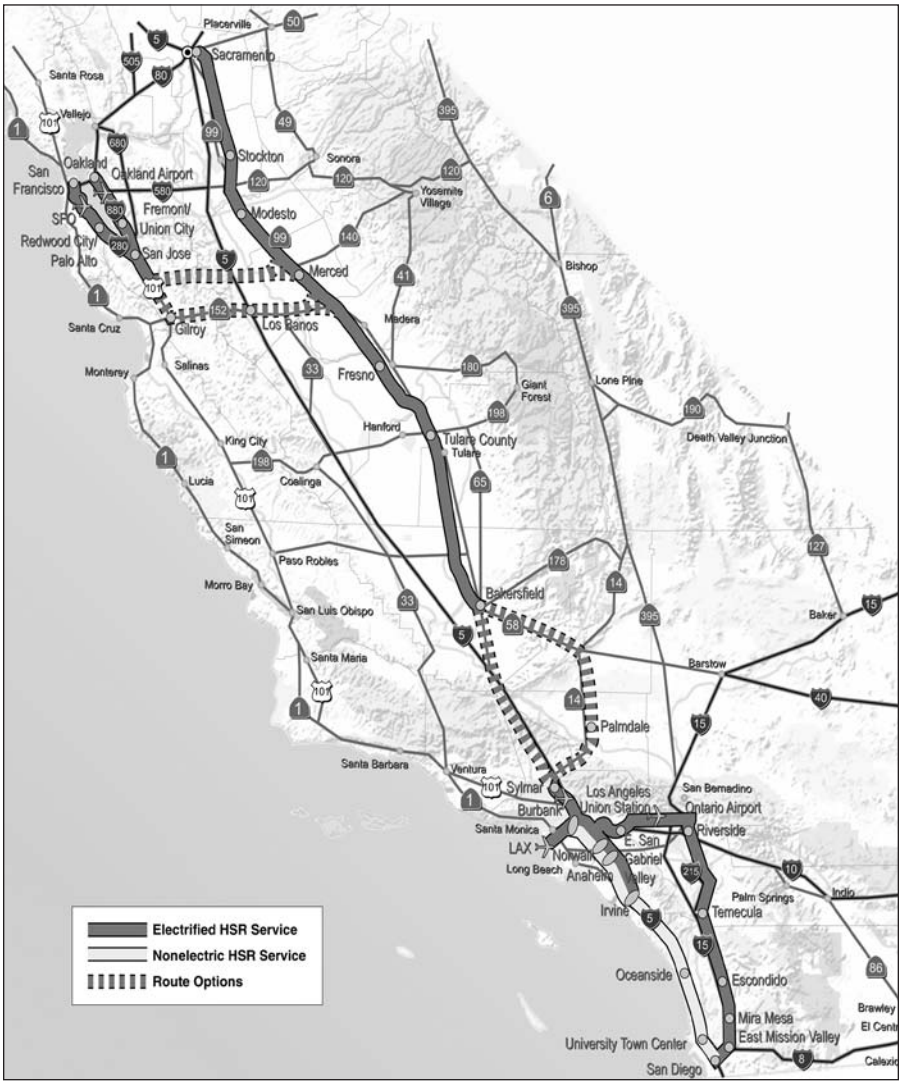
HSR stations may function more like airports than like traditional Amtrak or commuter rail stations, especially as the HSR system begins to "code share" or coordinate with the air travel system at hubs like San Francisco. This will require baggage handling, long-term parking, and car rentals, in addition to the other economic activities that stations foster. Station location therefore will be critical in the development of the surrounding areas.

Most challenging will be the integration of HSR stations and their functions into the city centers of the San Francisco Bay Area and Southern California. The most effective solutions—like the plans for Los Angeles Union Station and the newly upgraded Diridon Station in San Jose—will highlight transit connections, as well as parking.

In discussions about the number of stations in the system, high-speed operations advocates will argue for fewer stations, but local advocates will call for more. The operators have a point—too many stops will undermine the travel times that make the system viable. A necessary and sensible compromise would be "skip stop" operations, tailoring service to demand, with ongoing adjustments.

Keeping Proactive

Discussions of the plan should sift competing claims, identify what is relevant, and keep the focus on what an HSR system can do in and of itself and on what solutions it can offer to the state's transportation problems. Many institutions and processes must work cooperatively to bring the HSR system to fruition—for example, revising general plans, analyzing intermodal feeder services, locating park-and-ride operations, as well as fine-tuning economic development programs.



A draft program-level Environmental Impact Report–Environmental Impact Statement will describe the preferred alignment and station locations for the proposed 700-mile high-speed rail system connecting northern and southern California.

The no-build alternative is a call to continue the bimodal transportation system with its inherent tradeoffs. Because a systematic program of major airport capacity expansions is impossible, breakdowns and slowdowns of air services, especially on the shorter intrastate routes, will increase and remain the norm. Similarly, because significant expansion of highway capacity is not an option, breakdowns and slowdowns of traffic movements will increase and remain the norm.

The HSR proposal offers Californians an opportunity to make positive and proactive decisions, instead of passively reacting by fixing the latest trouble spots. The HSR proposal presents the state with an opportunity to add valuable and necessary transportation system capacity.

Answering the "All Aboard" Call

High-Speed Rail in Florida

On Track To Meet a Popular Mandate

NAZIH K. HADDAD

The author is Staff Director, Florida High-Speed Rail Authority, Tallahassee, and Vice Chair of the TRB Committee on Intercity Rail Passenger Systems.

Planning for high-speed intercity passenger rail service in Florida began more than 25 years ago and gained a boost in 1982, when Governor Bob Graham created the Florida High-Speed Rail Committee. The committee recommended public–private partnerships to implement high-speed rail in the state.

Following up in 1984 and again in 1991, the Florida Legislature passed bills to solicit proposals to design, build, and operate high-speed rail. Both times, private-sector consortia responded. In 1997, the Florida Department of Transportation awarded a franchise to the Florida Overland Express Corporation to design, build, operate, and maintain a high-speed rail system linking Miami, Orlando, and Tampa. Although the franchise terminated in early 1999 because of a lack of state and federal capital funding, the state's need for high-speed rail became more pressing and more evident.

Constitutional Amendment

Florida has the fourth largest state population and attracts more tourists than any other state. The large, continually growing resident and tourist populations have increased intercity travel—for example, the Miami-Orlando-Tampa corridor is expected to log more than 100 million intercity trips per year or 300,000 trips per day by 2010.

With the inevitable congestion on the state's highways and a lack of air space to accommodate increases in short-distance flights between Florida cities, the development of a new mode of intercity travel such as high-speed rail has gained the support of state residents. On November 7, 2000, voters approved a new amendment to the Florida Constitution, directing the state legislature, the Governor, and the cabinet to develop a high-speed ground transportation system

> …consisting of a monorail, fixed guideway, or magnetic levitation system, capable of speeds in excess of 120 miles per hour,…[using] innovative, efficient, and effective technologies consisting of dedicated rails or guideways separated from motor vehicular traffic that will link the five largest urban areas of the state…and provide for access to existing air and ground transportation facilities and services. The legislature, the cabinet, and the governor are…directed to proceed with the development of such a system by the state and/or by a private entity…, including the acquisition of right-of-way, the financing of design and construction…, and the operation of the system,…with construction to begin on or before November 1, 2003.[1]

Rail Authority Funding and Findings

In response, the Florida Legislature enacted the Florida High-Speed Rail Authority Act, creating a 10-member High-Speed Rail Authority to plan, administer, and manage the operation of a system. The act required the development and operation of the first segment of the system between St. Petersburg, Tampa, and Orlando, with future service to Miami.

In 2001, the Florida Legislature appropriated $4.5 million for the Authority and in 2002 passed bills expanding the Authority's powers and providing an additional $4.5 million in state funds. The Authority also has received $3 million in federal funds and expects up to $6 million from the U.S. Congress this year.

The Authority's first charge was to prepare a report to the Legislature, submitted in January 2002. Key findings included the following:

- High-speed rail must be evaluated in the context of a statewide system. (The vision for the system is shown in the maps on page 17.)
- High-speed rail can be implemented with private funding for operations and maintenance and with a mix of private and public funding to build the infrastructure.
- Federal funding is essential.
- The economic benefits of high-speed rail would exceed the costs of implementation.
- Technology should be selected through a competitive process.
- Flexible procurement is advisable—for example, a design, build, operate, maintain, and finance arrangement.

[1] Florida Constitution, Article X, Section 19.

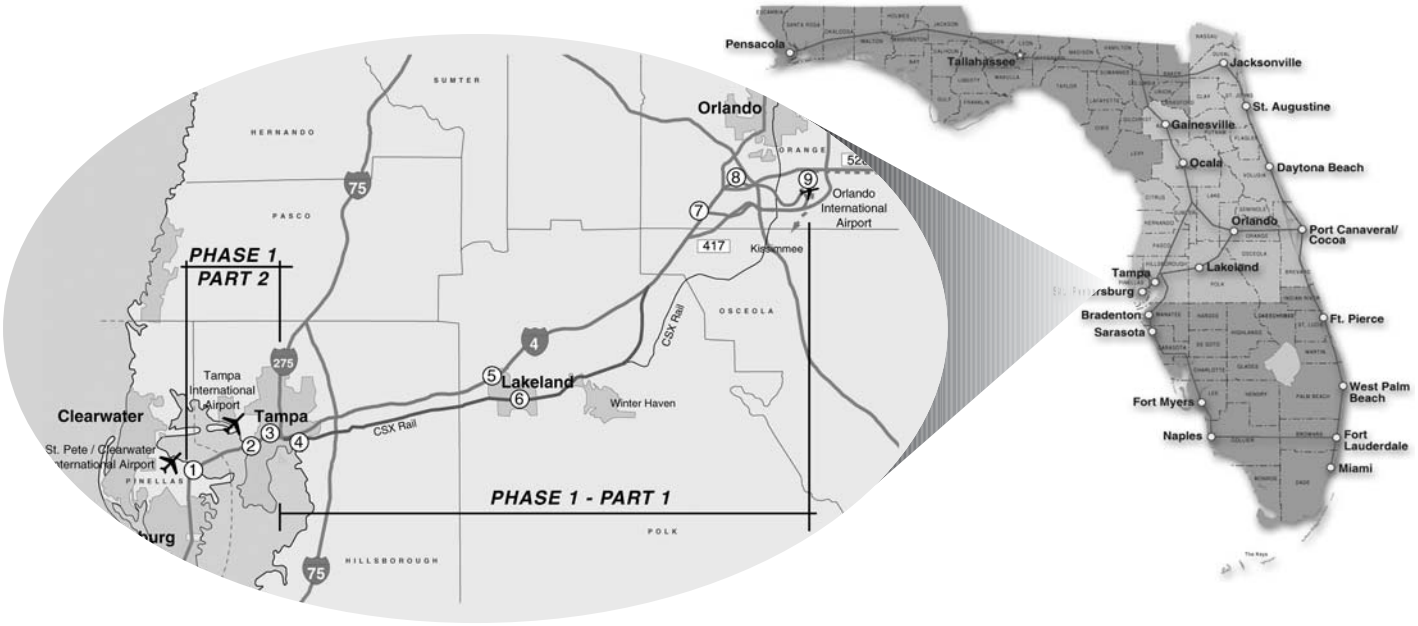


FIGURE 1 Statewide system envisioned by Florida High-Speed Rail Authority.

Implementation Plan

Since its first meeting in July 2001, the Florida High-Speed Rail Authority has made progress in planning the system, preparing for the mandatory start of construction in November 2003. Many critical activities are either under way or about to begin.

Procurement and Environmental Processes

The Authority is preparing engineering and environmental studies for the first phase from Tampa to Orlando, for the federally required Environmental Impact Statement (EIS). To meet the construction start date, the Authority, working with the Federal Railroad Administration, has developed an innovative approach.

The usual procedure has been to complete the EIS and then begin procurement. The Authority instead will keep on schedule by integrating the responses to the request for proposal (RFP) into the EIS as alternative plans.

The responses to the RFP also will provide valuable insights into the technical evaluation of alternatives. In addition, the early incorporation of the RFP responses will enable the Authority to make recommendations to the Legislature for state and federal funding. Key dates for the procurement and EIS schedules are

October 2002	RFP issued
February 2003	Proposals due
July 2003	Public hearing on the draft EIS
September 2003	Vendor selected
November 2003	Final EIS
February 2004	Federal Record of Decision on EIS

RFP Scope

Development of the RFP started in April 2002. Proposals must include the engineering and environmental documentation required for the EIS. In addition, the Authority is working on

- Station concepts,
- Development programs,
- Financial information,
- Marketing plan,
- Operating criteria, and
- Evaluation criteria.

While preparing the draft RFP, the Authority will seek comments from private-sector vendors interested in the project.

Ridership Studies

In the 2002 Report to the Legislature, the Authority issued preliminary ridership forecasts for the first sys-

tem segments. Ridership from Tampa to Orlando is expected to range from 2.6 million to 3.6 million per year, depending on the technology and route selected.

Although the planning-level estimates have been sufficient for the work to date, more detailed estimates are needed to satisfy the requirements of the RFP. To prepare investment-quality estimates, the Authority has established a ridership steering committee and has retained two consulting firms to prepare independent estimates of ridership.

A steering committee will oversee the preparation and reconciliation of the independent estimates, with help from an independent peer review panel that will examine the preparation of the estimates during vendor workshops. Initial results of the ridership estimates will be available to the RFP respondents in November 2002.

Strategic Planning Session

The Authority's activities so far have focused on planning. In the next few years, however, the mission will evolve to include procurement, contract negotiations, construction, and operation of the high-speed rail network. As the mission expands, additional resources will be necessary.

To plan for future growth, the Authority is conducting a strategic planning session in September 2002. The Authority has invited rail operators, system designers, financial experts, and key Congressional staffers to the session and is soliciting

Maximizing the Capacity of Shared-Use Rail Corridors

JOHN A. HARRISON

Intercity passenger trains in the United States predominantly operate in shared-use rail corridors. The trackage of the most densely traveled rail passenger route in the United States—Amtrak's Northeast Corridor from Washington, D.C., to Boston, Massachusetts—carries Amtrak *Acela Express* trains at up to 150 mph, Acela Regional trains, Amtrak long-distance trains, commuter rail, and freight trains. Other high-density rail corridors that mix passenger and freight trains are mostly privately owned freight lines with limited passenger service.

With demand increasing for more and faster rail service, and with more commuter and intercity passenger and freight trains sharing trackage, the capacity of railroad lines to handle more trains without loss of on-time performance is a major concern for railroad owners, operators, planners, and policy makers. How to provide adequate capacity in densely traveled rail corridors has become the central issue in planning for passenger and freight rail traffic.

A TRB workshop at the January 2002 Annual Meeting in Washington, D.C., addressed the complex issue of railroad capacity and corridor planning. More than 80 participants discussed such questions as "What is railroad capacity and how does it fit into passenger rail corridor planning?" and "What are the elements that determine capacity, and how do they interact?'

Practical Capacity

Practical capacity—the number of trains that can be accommodated reliably with acceptable transit times—varies with the mix of traffic; the number and configuration of the tracks; the types of signals, controls, and communications systems; track conditions; maintenance requirements; and the numbers and locations of sidings or multiple-track segments. Every rail corridor therefore is unique and has its own inherent capacity. Nevertheless, identifying, categorizing, and quantifying factors that limit capacity can help transportation planners, railroad owners, and operators to plan for growth and determine necessary investments.

Line capacity is a function of train acceleration and braking rates, train lengths, safe braking distances and times, train headways—affected by train performance, train length, signal systems, and human factors such as reaction times—and the number of tracks and the spacing of crossovers. Several general observations emerge from railroad operating experience:

- The more uniform the performance of trains in mixed traffic, the higher the practical throughput as a rail line approaches capacity.
- Conversely, the greater the variation in train types and in train performance in mixed traffic, the lower the practical throughput.
- On single-track lines with passing sidings, the more trains, the greater the delays—the number of meets has a compounding effect as delays increase the probability of other meets. Adding trains decreases the average speed, increases trip time, and decreases reliability.
- Maneuvers for trains overtaking trains on the passing sidings to single-track lines can consume capacity. Overtakes are feasible only if traffic is not at high levels—otherwise, unacceptable delays occur.

comments from parties interested in partnering with the state to establish high-speed rail service.

Continuing Innovation

Florida voters, recognizing that highway and air traffic congestion will continue to increase, approved an amendment to the Florida Constitution, mandating that high-speed rail begin construction in November 2003. The state Legislature formed the Florida High-Speed Rail Authority to address the mandate.

The Authority has conducted preliminary planning studies and has reported to the Florida Legislature that high-speed rail could be commercially feasible, producing substantial economic benefits. The Authority has proceeded with engineering and environmental studies and has begun a procurement process to select a contractor to design, build, operate, maintain, and finance the first phase of the system.

To meet the construction start date, the Authority is pioneering the integration of the procurement and the environmental impact study processes. Another innovation is the preparation of investment-quality ridership estimates by reconciling two peer-reviewed, independent estimates of ridership. Continued innovation will be necessary as the Authority works to meet the mandate from Florida's citizens.

Website

Florida High-Speed Rail Authority
www.floridahighspeedrail.org/

◆ Centralized traffic control or real-time communications-based train control can improve throughput and reliability.

Planning and Integration

As noted in the workshop, perhaps the most economical system for mixing trains at differing speeds is incremental train control, which overlays the main system with an alternate signal system. Onboard cab signaling gives higher-speed passenger trains a higher allowable speed profile and ensures that safe braking distances are maintained (*1*).

Scheduling generally accommodates intercity passenger and commuter trains first, incorporating detailed plans for stops and for meet locations and times. Then freight trains are added according to type—intermodal, manifest, bulk commodity, or local—and according to schedule priorities. Some intermodal freight trains must meet contractual arrival times or incur costly penalties.

Train stringline analysis and Monte Carlo simulations can project average delays for meets and overtakes. These analyses also can reveal the necessity and extent of capacity improvements to accommodate current and future mixed traffic.

The requirements for train planning and traffic integration are route-specific, but the following generalizations can be made, as noted in the workshop summary by moderator Paul Reistrup of CSX Corporation:

◆ Freight customers, like passengers, have service demands. Freight trains may need to operate within scheduled "windows" during peak commuter hours.

◆ Capacity alters with the mix of traffic. Generally, the greater the speed differential of the trains, the greater the capacity required.

◆ Depending on the plant, the practical capacity of a single track is 8 to 12 trains per day in each direction. Track may appear unoccupied but must be reserved for approaching trains.

◆ Increasing speed in sidings, reducing siding-to-siding spacing and time, improving train control systems, and adding double track can increase track capacity. Electrification is another way of increasing capacity, but usually after all other means have been employed.

◆ Accommodating passenger train operations when the main track has substantial freight occupancy requires service tracks or industrial sidings off the mainline, especially at entrances to freight yards.

Commuter operations raise special challenges. If not properly planned, train schedules can preclude other passenger or freight operations. Two-way commuter operation is generally not practical on single track, unless double-track sections or passing sidings are strategically placed to handle meets. Even so, trains in the nonpriority, or off-peak, direction generally will experience delays or require a longer schedule to allow on-time train performance in the peak direction.

When adding or expanding passenger operations on freight lines, the objective is to provide the plant capability and the train control to maintain reliable passenger and freight operations. Computer simulations can assist in capacity analysis and planning.

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Andrew Galloway, Amtrak, addresses a remark to panel at Workshop on Railroad Capacity and Corridor Planning at TRB's 2002 Annual Meeting.

POINT OF VIEW

Intercity Passenger Rail That Works

You've Got To Have Connections!

GEORGE HAIKALIS

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In resuming the debate about the shape and extent of intercity passenger rail service, members of the U.S. Congress should keep in mind the need for intercity rail to interface creatively with other modes. Beginning with the Intermodal Surface Transportation Efficiency Act and continuing with the Transportation Equity Act for the 21st Century, Congress has recognized the substantial public benefit of cooperative planning for federal investment in each mode. Yet until public investment is allowed in intercity passenger rail, interfacing with other modes will be difficult.

The current debate about Amtrak recalls the debate in the early 1960s over capital and operating subsidies for urban rail. Plans for pioneering systems such as the Washington, D.C., Metro and San Francisco's Bay Area Rapid Transit assumed that operating surpluses would underwrite a portion of the capital investment. However, it soon became clear that without operating subsidies, these urban rail systems would not achieve the intended public benefits. For the past 30 years, however, Congress has pursued a policy of capital investment in Amtrak in the hope of eventually avoiding operating subsidies.

Successful, nationwide intercity passenger rail service will require public funds for operations as well as for capital investment, to keep fares affordable and to attract a wide range of passengers. In the coming year, Congress must determine what kind of nationwide passenger rail service is in the public interest, calculate the amount of money needed to provide the service, and then appropriate the resources.

Targeting the Service

Public support for a surface alternative to air travel has increased since the terrorist attacks of September 11, 2001. The time and cost required for new security measures at airports—along with a growing apprehension about flying—have produced dramatic declines in air travel.

Intercity passenger rail service, however, has absorbed only a small portion of the shift from air travel—Amtrak already was operating long-distance trains at near capacity. Intercity buses also have not picked up much of what the air travel market has lost.

Although supporting data are sparse or unavailable, the automobile appears to be the choice of many travelers for long trips. But even before September 11, the American Travel Survey had indicated that more intercity travelers preferred travel by car to travel by air for trips of up to 1,000 miles.

Until recently, improvements to intercity rail travel have focused on speed. TRB's first study of intercity rail was titled *In Pursuit of Speed*.[1] Amtrak's Northeast Corridor high-speed rail improvement project specified equipment capable of traveling at 150 mph, but only a few miles of the route can sustain that velocity—the Boston–Washington, D.C., *Acela Express* averages 70 mph.

Designing an intercity passenger rail system that appeals to travelers who prefer not to travel by air requires another approach. Competing with the travel times for automobiles may be more important than matching air travel times. Frequency, price, comfort, and reliability should be emphasized, as demonstrated by the success of California's Capitol Corridor program, which averages only 42 mph on its Sacramento–Oakland–San Jose route across the heavily congested San Francisco Bay Area.

Intramodal Connections

Intramodal connections are an important attribute of a successful intercity rail network. Much of the early planning for high-speed intercity rail in the United States has focused on linking city pairs that already had active air connections.

Recent studies have shown, however, that intercity travel is diffuse. In California, high-speed rail studies have indicated that multiple connecting routes would attract more passengers than a single San Francisco–Los Angeles line. In the Midwest, high-speed rail efforts have focused on a Chicago hub serving many city pairs with connecting trains.

Using hubs for through-routing is even more effective—that is, for connecting spokes that have affinities, such as the Boston–Washington, D.C., service through New York. Chains of city-pairs like New York–Buffalo, Buffalo-Detroit, and Detroit-Chicago can form long through-routes serving multiple travel markets.

[1] *Special Report 233: In Pursuit of Speed: New Options for Intercity Passenger Transport*. TRB, National Research Council, Washington, D.C., 1991.

The challenge is to achieve reliable intercity service on routes hosted by freight railroads. This will require partnerships with privately owned carriers.

Multimodal Interfaces

The Northeast Corridor demonstrates the utility of well-located interfaces between intercity rail and other modes. Each major Amtrak station on the corridor is served by a variety of other modes. The automobile is ubiquitous, but the availability of subway, commuter rail, light rail, local bus, and intercity bus extends the reach of intercity rail.

In addition, many of these stations are near the central business districts, so that many destinations are within walking distance. Some stations also are providing bicycle storage, a feature common in Europe.

In other parts of the United States, the interface between intercity rail and other modes is less well developed. The expansion of urban rail systems in the past 30 years was not accompanied by expansion of intercity rail. As a result, Amtrak provides minimal service to many large U.S. cities.

Major American rail stations have been demolished or converted to other uses. Freight railroads have abandoned the operation of well-located, but lightly used, passenger-only rail lines in many urban areas. Remote Amtrak stations, sometimes serving only one train daily, have not been integrated into new rail transit systems, and local bus service to these stations is limited.

A new appreciation of rail stations as historic and cultural treasures has led many communities to seek federal transportation funds for preservation and restoration. In many cases, the restored stations also have served as transfer hubs for intercity buses and local transit. A comprehensive plan to expand intercity bus service from smaller towns, resorts, and rural areas to these stations depends on plans for intercity rail.

Planning Intercity Rail

Reviving intercity passenger rail service requires improved interfaces with other transit modes. Local transit agencies must be willing to cooperate with intercity rail planners. Metropolitan planning organizations (MPOs)—the governmental entities that coordinate and allocate federal transportation funds in large urban areas—can play an important role in facilitating cooperation.

Because many urban areas are fully developed, the only corridors available for new urban transit systems often are rights-of-way owned by freight railroads. New commuter rail or light rail services have started up on some of these lines. A comprehensive approach must consider the conflicting needs of freight railroads, urban transit, and intercity rail.

Passengers at Sacramento Depot Station in California alight Capitol Corridor train—which has attracted ridership with frequency, price, comfort, and reliability instead of high speeds.

Resolving these conflicts will be a challenge for MPOs. Although commuter rail and intercity rail can share the same tracks and facilities, planning for joint use must begin early. Greater federal leadership also will be needed to make full use of rail assets in metropolitan areas.

The Federal Railroad Administration has funded planning studies to improve the efficiency of freight railroads in metropolitan areas and to reduce the cost of eliminating highway grade crossings. Federal agencies also are examining the shared use of rail lines for urban rail transit and intercity rail, if safeguards can be established.

Air–Rail Interface

A longstanding issue, more critical now with the increased emphasis on airport security, is the air–rail interface. Many U.S. cities—like Atlanta, Georgia; Chicago, Illinois; and Portland, Oregon—have extended their urban rail transit systems to their major airports. With a few noteworthy exceptions, however, these links do not effectively serve intercity rail corridors.

The recent extension of the interterminal monorail at Newark International Airport in New Jersey to a new commuter rail and Amtrak station on the Northeast Corridor Line has demonstrated the utility of links to intercity rail. More links are planned, although complex issues remain.

For example, a narrow view of the restrictions on

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POINT OF VIEW

Improving U.S. Passenger Train Performance

Three Challenges and Two Questions That Must Be Resolved

ANTHONY PERL

The author is Director, Aviation Institute, York College, City University of New York, and author of New Departures: Rethinking Rail Passenger Policy in the Twenty-First Century. *He is a member of the TRB Committee on Intercity Rail Passenger Systems and of the TCRP Project Panel on New Paradigms for the Internal Structure of Public Transit.*

Amtrak can—and should—enhance its passenger train performance. To achieve long-term success in meeting intercity travel needs, however, decision makers must go back to the drawing board to design a new passenger rail policy. This long-overdue effort could go in several directions but would enable new approaches to moving people by rail.

Policy research that revisits and seeks to overcome the political impasse blocking innovation in organizing and funding passenger rail service is an essential complement to any commercial and technical research. Policy changes will stimulate passenger rail to make the kind of analytical, organizational, and technical innovations that have enabled the success of other passenger modes.

New public policy must address three challenges to the future of passenger rail:

1. Institutional isolation,
2. Flawed corporate structure, and
3. Atrophy of the supporting industry.

Institutional Isolation

Amtrak is institutionally isolated from the fiscal partnerships of federal and state governments that undergird the rest of the U.S. passenger transportation infrastructure. Highways, airports, and urban transit systems could not deliver substantial economic and political benefits without the programs established to plan and finance infrastructure.

Through the federal aid programs for these modes, planners, engineers, researchers, and others work full time on ways to move people faster, cheaper, and with fewer negative impacts on the environment. Nonetheless, the Federal Railroad Administration (FRA) plays only a modest role in planning and financing passenger rail systems, compared with the roles that the Federal Highway Administration, the Federal Aviation Administration, and the Federal Transit Administration play in advancing the development of their modes.

One reason that Amtrak must fend for itself in developing the potential for passenger rail is that the tracks and rights-of-way for passenger trains outside the Northeast Corridor are privately owned by carriers focused on moving freight. When it was established in 1970, Amtrak was structured as a joint venture between the government and the railroads, which participated to gain release from the public service burden of maintaining unprofitable passenger operations.

The seeds of an innovative joint venture—a public–private partnership—were sown, but the potential for a new relationship between government and the freight railroads was never realized. Amtrak had little to offer the railroad shareholders or other partners interested in making money.

Except for supporting Amtrak, the federal government has little opportunity to advance passenger train development, and options for state governments also are restricted. Some states have worked on planning and financing to expand intercity passenger rail. But because Amtrak is funded through legislation that is isolated from other transportation modes, the formulas for federal transportation allocations allow the states almost no credit for supporting rail.

Many of the state and local officials who implement much of America's transportation policy regard Amtrak as a charity case. Finding a way for public investment in mainly privately owned rail rights-of-way is therefore a crucial policy problem to resolve before progress can be made in restructuring and revitalizing passenger train service.

Flawed Corporate Structure

The second policy challenge is Amtrak's organizationally flawed corporate structure, which makes it difficult to do a decent job of passenger rail management. Amtrak's structure does not allow an effective focus on the commercially viable services that could compete with airlines and bus companies or that could develop new travel market niches, such as "land cruises." The structure also prevents management from addressing the inherently unprofitable operations that are preserved through government subsidy and justified by public interest criteria similar to those applied to public transit.

No other transportation carrier in the United States is expected to provide market and nonmarket services under the same managerial umbrella. Amtrak and other carriers that may launch intercity passenger rail operations need flexibility in applying different business techniques to different types of service.

Developers also need clear direction from government about services that are justified in the public interest and therefore eligible for direct or indirect subsidies. But organizational challenges extend beyond clarifying distinctions between market-focused and social services.

Compared with the management of air or bus carriers or even of the automobile industry, Amtrak management is closely watched and regularly faces criticism for losing money. For example, from 1997 to 2002, a publicly supported "devil's advocate," the Amtrak Reform Council, evaluated Amtrak's prospects for achieving commercial self-sufficiency. Improving passenger train operations becomes more difficult and risky when political oversight is intense and contentious.

Amtrak receives small incentives for innovation but large penalties for failure. The organization that delivers passenger rail service should be insulated from the political debates over the principles and the options for funding and regulating its transformation. Nevertheless, any publicly supported carrier must be fully responsible and accountable for the federal and state funds it receives.

Industrial Atrophy

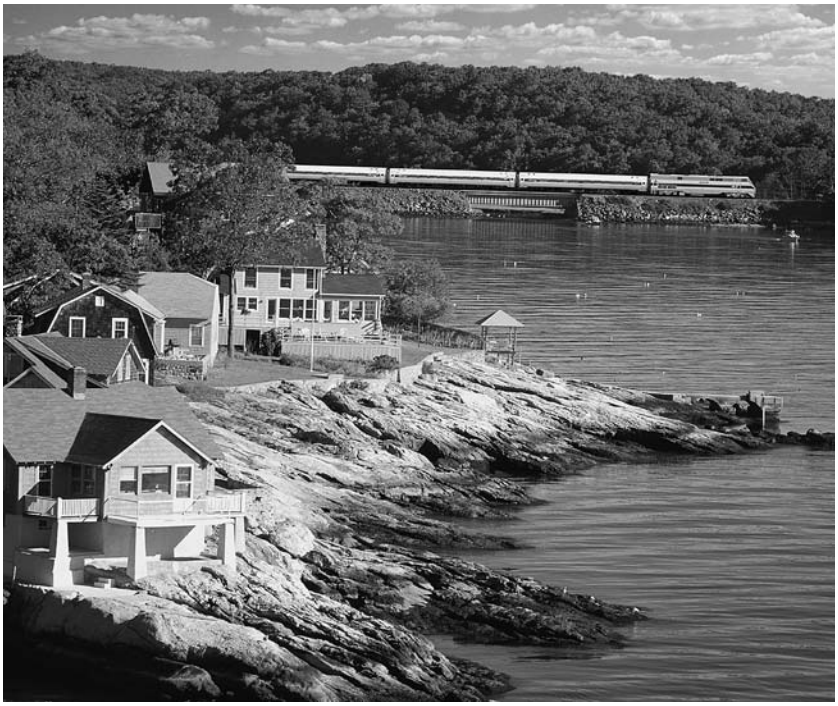
The third and perhaps most daunting policy challenge is that America's passenger trains have been industrial orphans since the 1970s. The network of technical skills and design capacities in passenger railroading that once supported American railroads—for example, through locomotive builders, rolling stock manufacturers, signal makers, and communications suppliers—has dwindled away. The spread of aerospace and automotive design, development, and manufacturing across North America highlights the atrophy of the industry supporting passenger trains.

Know-how still may thrive at the overlap of freight with passenger rail engineering and design but would not be sufficient to launch and sustain the passenger rail renaissance that has occurred in other nations. Public support for research and development through FRA or through partnerships with industry must be scaled up to advance the industrial development necessary for passenger rail renewal.

Toward a Coherent Policy

These three obstacles to renewing passenger rail are not insurmountable. Significant dividends would arise from quitting the narrowly focused battles over Amtrak's fate and instead creating innovative policy to spur a rail renaissance.

The Northeast Corridor's *Acela Express* has provided a glimpse of what can be possible when resources are devoted to upgrading infrastructure and deploying modern trains. This modernization—modest compared with European and Japanese efforts to create a "new model railroad"—is only a fraction of the success that modern trains supported by effective policy could bring to the United States.



Amtrak's *Twilight Shoreliner*—running through Rocky Neck, Connecticut, in the Northeast Corridor—is an example of an effective, modern, and successful U.S. passenger train. Revised policies can build on and spread this kind of success.

The options for organizing and delivering more effective passenger trains must connect into the framework of American governance. In the rush to create Amtrak—and subsequently to attack or defend its performance—fundamental relationships between federal and state governments, as well as between government and private industry, were neglected. Making these connections is essential if policy innovations are to enable successful passenger rail.

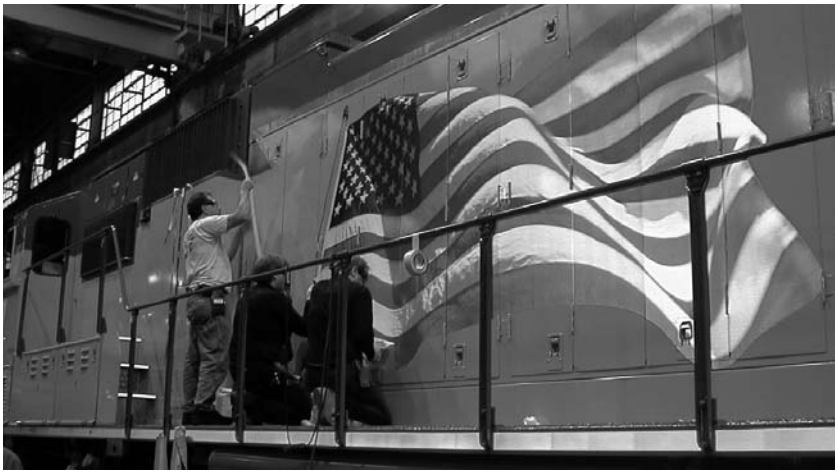
Two key questions must be answered:

1. Where should the primary responsibility for passenger rail policy be located within the American political system?
2. What relationship should business—or the private sector—have with the government in delivering passenger rail services?

The principles that guide industry success in transportation and other sectors depend on coherent answers to these political and economic questions. The United States has lacked this kind of coherence in passenger rail operations for more than 30 years.

Defining Government Roles

The United States is structured as a political federation. Different levels of government take



Workers at General Motors plant in London, Ontario, put finishing touches on locomotive for freight use. A renaissance in passenger rail will require a revival of support industries.

responsibility for acting on behalf of citizens. National, state, and sometimes also local and regional governments exercise jurisdiction over policy responsibilities based on a constitutional division of powers.

In practice, few policy problems fall into the compartments that constitutional architects once envisioned for national and subnational government jurisdictions. But when activities to formulate, implement, and finance a policy or program cross jurisdictional bounds, one level of government will take the lead in articulating goals and acceptable or preferred outcomes.

In the financing of transportation infrastructure, in the enforcement of business, environmental, and safety regulations, and in the provision of transportation services, states handle some activities and the federal government others. These charges often set one mode's policy framework apart from another's.

Similar distinctions should be made between passenger rail policy options that would involve federal government leadership and those that may require state leadership. Explicitly defining government roles in intercity transportation before launching any new policy will make the policy more likely to succeed.

Public and Private Involvement

The economic choice that is key to developing effective public policy is whether the activity will be carried out primarily in the private sector or in the public sector. Today few economic activities are exclusively private or public, yet identification with one or the other sphere makes a difference in expectations about organization, financing, and accountability.

Most intercity transportation policies in North America presume that a private operator will provide the mobility—for example, an individual owner of a motor vehicle, a for-profit airline, a bus company, or a trucking firm. Rail passenger policy, in contrast, reverses the roles of public and private involvement—publicly owned Amtrak operates many trains on privately owned infrastructure.

Rail passenger policy options, therefore, should consider harmonizing the passenger train model with the models for other modes. Moving beyond status as a quasi-public enterprise will help Amtrak or other rail carriers deliver more effective services.

Clear answers to the questions of what roles national and state governments should play and of the ways that government and business should interrelate in providing passenger rail services would strengthen the prospects for passenger rail in America.

Intercity Passenger Rail That Works

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federal airport funding has limited the use of the new Newark Airport train station to airport travelers. This curtails the potential for economic development in a community that has lagged behind the state in income growth. Furthermore, the frequency and pricing of commuter rail services has limited the utility of the air–rail interface both at Newark and at the Baltimore-Washington International Airport train station, which is now accessible via an airport shuttle bus.

An MPO or a group of adjoining MPOs can address such issues, working with state and federal transportation officials. Airport access can affect the relative utility of competing airports that serve a metropolitan area. With aircraft noise a major issue in airport development, a comprehensive plan that considers access and environmental issues, as well as the potential for intercity rail to reduce airport expansion requirements, needs to be developed. Planning for the air–rail interface requires resources, but each transportation agency has much to gain through cooperation.

Moving Forward Nationwide

These intermodal planning issues can be resolved when Congress decides on the funding of intercity passenger rail systems. Advancing metropolitan and statewide plans for public surface transportation and airport development depends on a long-term approach to federal funding for intercity rail.

With the air travel crisis after the attacks of September 11, the general public would welcome a coordinated effort to improve surface transit alternatives. Without leadership from Congress or from the Administration, the benefits of intercity rail will continue to remain unrealized. The United States can do better in developing the potential of a nationwide intercity passenger rail network.

Limiting the Effects of High-Speed Dynamic Forces on Track Structure

New Method for Evaluating Equipment

ALLAN M. ZAREMBSKI AND JOHN G. BELL

Zarembski is President, ZETA-TECH Associates, Inc. Bell is Technical Director—Vehicles, Parsons Transportation Group, and formerly Program Director, High-Speed Train Sets, Amtrak.

Researchers have developed a method to evaluate potential damage and to avoid dramatic increases in track damage, degradation, and maintenance expenses in the Northeast Corridor. The method can be used to evaluate other proposed high-speed rail corridors and equipment.

With the introduction of new-generation high-speed trains on the Northeast Corridor, Amtrak faced the challenge of procuring train sets that would minimize the increase in track degradation and maintenance expenditures. As vehicle operating speeds increase, the dynamic wheel–rail impact forces on the track structure increase. High-speed passenger operations can produce significantly greater wheel–rail dynamic forces. These intense forces in turn can accelerate track degradation and component failure, requiring frequent track maintenance and increasing maintenance costs.

Problem

Engineers recognized the potential effect of high-speed operations on track degradation and faced a specific challenge in designing the new equipment. Despite the increase in operating speed from 125 mph to 150 mph, the new equipment would have to avoid increasing the dynamic vertical wheel–rail forces applied to the track. A method for evaluating the potential damage associated with the new high-speed equipment was not available and had to be developed.

Amtrak's *Acela* train sets are designed to minimize the effects of heightened wheel–rail forces at traveling speeds of 150 mph.

Solution

While three vendor consortia worked on alternative high-speed train set designs, Amtrak commissioned the development and implementation of a method to evaluate the potential for track damage associated with the older equipment and the new high-speed equipment. The objective was to quantify the levels of dynamic track loading associated with the 125-mph operations and the levels that would be applied by operating the proposed new generation of equipment at 150 mph. The approach would provide a means for assessing the expected level of track damage and for modifying the proposed designs to minimize or eliminate the increase in dynamic wheel–rail loading.

An analytical–empirical approach was developed and implemented, considering the effects of operating speed, unsprung mass, and track condition, and focusing on the vertical wheel–rail dynamic forces generated by high-speed operations. The P_1 and P_2 impact forces (as illustrated in Figure 1) are relevant to track deterioration.

The P_1 forces are high-amplitude, short-duration (high-frequency) dynamic impact forces that usually are attenuated rapidly by the track structure. These forces contribute to the cracking of concrete ties—experienced by Amtrak in the late 1970s and early 1980s. The P_2 forces are lower-amplitude, longer-duration (lower-frequency) loads that contribute primarily to the degradation of track geometry, which is the largest maintenance expense on the corridor. As shown in Figure 1, the P_1 impact forces could be as high as 3.5 times the static load imposed by the wheel on the rail, and the P_2 impact forces could be as high as 2.5 the static load.

Developing the methodology required calibrating the theoretical impact force relationships using actual wheel–load impact data from Amtrak operations in the Northeast Corridor. From the calibrated equations, the dynamic impact forces generated by Amtrak locomotives—specifically the AEM7 and F40—were determined for wood and concrete crosstie track. These forces provided a baseline for comparison with the forces generated by other equipment.

Other impact load limits, such as those established in earlier studies for limiting concrete tie cracking in

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Research Pays Off

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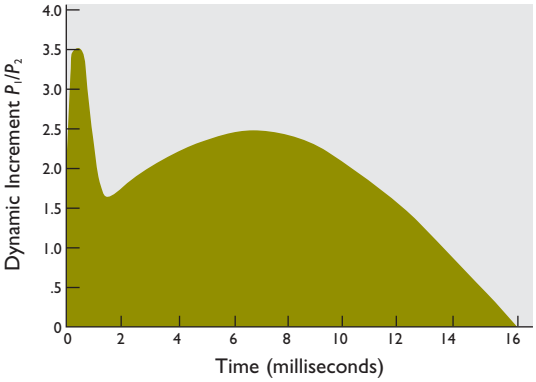


FIGURE 1 Dynamic forces on track.

the Northeast Corridor, were used to assess the severity of the forces. The dynamic impact forces generated by nine different high-speed train set configurations proposed by the three vehicle consortia were then calculated and compared with the baseline force levels and specific impact load limits.

Benefits

Analysis of the results showed that four of the nine originally proposed train set configurations required some degree of speed reduction to ensure that no tie cracking damage would occur. The other five configurations generated P_1 and P_2 force levels within an acceptable range. Using these results and the method for calculating the P_1 and P_2 forces, Amtrak developed a "go or no-go" criterion for evaluating proposed high-speed train sets and identifying train set configurations that would not accelerate the rate of change to the track structure on the Northeast Corridor.

Although developed to evaluate equipment proposed for operation in the Northeast Corridor, the method also can be used to evaluate other proposed high-speed corridors and equipment to avoid dramatic increases in track damage, degradation, and maintenance expenses.

For more information contact Allan M. Zarembski, ZETA-TECH Associates, Inc., 900 Kings Highway North, Cherry Hill, New Jersey 08034 (telephone 856-779-7795, e-mail zarembski@zetatech.com).

EDITOR'S NOTE: Appreciation is expressed to Amir Hanna, Transportation Research Board, for his efforts in developing this article.

Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001 (telephone 202-334-2952, e-mail gjayaprakash@nas.edu).

SPECIAL FEATURE

Countering Terrorism in Transportation

National Academies Panel Examines the "New Transportation Security Imperative"

MORTIMER L. DOWNEY AND THOMAS R. MENZIES

Mortimer L. Downey, Deputy U.S. Secretary of Transportation from 1993 to 2001, is principal consultant with PBConsult. He chaired the Panel on Transportation of the National Academies Committee on Science and Technology for Countering Terrorism. Thomas R. Menzies, Senior Program Officer in the National Research Council's Transportation Research Board, was study director for the panel.

From jet airliners to mass transit buses and rail terminals, transport vehicles and facilities are all-too-familiar targets for terrorism. Yet the United States cannot accept recurrence as inevitable. Terrorist attacks on the transportation system can be deterred and can be derailed.

Successful transportation counterterrorism, however, requires a new strategy. The traditional, blanket approach of trying to protect every possible opening for terrorists is expensive—and was ineffective on September 11, 2001. Perimeter defenses of "guards, guns, and gates" will not work in the vast and open transportation sector.

Instead, the new strategy should rely on a layered security approach that combines deterrence, protection, and preparation. The emphasis should be on building security into transportation systems by understanding how these systems work and then using this understanding to mesh security features with system operations and objectives.

Developing better transportation security strategies is a job for the newly created federal Transportation Security Administration (TSA), working with public and private owners, operators, and users of transportation. Following are recommendations for how TSA should proceed, developed by the Panel on Transportation of the National Academies Committee on Science and Technology for Countering Terrorism (see box on page 29) and published in July as *TRB Special Report 270: Deterrence, Protection, and Preparation: The New Transportation Security Imperative*.[1]

Layered Security

The transportation sector must be kept open and accessible. Restrictions on openness and accessibility can send costly ripple effects throughout the national economy and society. Nonetheless, the sheer scale and scope of the transportation enterprise precludes the tailoring of defenses to every potential vulnerability.

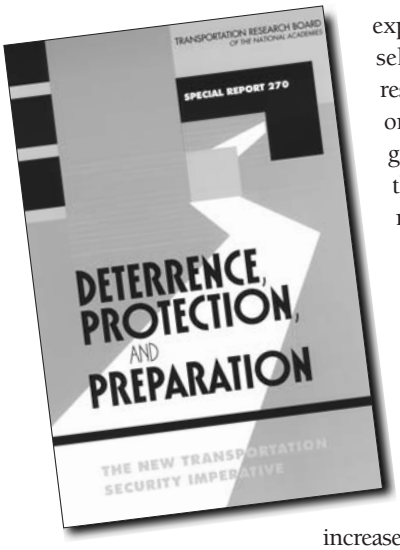
ALSTEC LTD.

Security measures should be integrated into regular services. For example, security screening that also reduces luggage loss offers airline passengers and airlines a double benefit.

The tailored approach to security failed tragically on September 11. The suicide hijackers were confronted with airport metal detectors and scanners designed to intercept handguns. By defeating these systems, the hijackers circumvented the entire security regime—nothing else stood in the way.

Yet the airlines and federal government had other security systems that could have foiled the hijackings. A computer-assisted passenger prescreening system (CAPPS) enables airlines to single out the checked luggage of some travelers for intensive screening for explosives. Deployed in response to the 1988 Pan Am suitcase bombing over Scotland and the 1996 TWA

[1] The full report of the National Academies Committee, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, is available at www.nap.edu/catalog/10415.html and contains the recommendations of the Panel on Transportation as Chapter 8.



Special Report 270: Deterrence, Protection, and Preparation: The New Transportation Security Imperative is available from TRB (see Publications Order Form in this issue).

explosion off Long Island, New York, CAPPS selects travelers with certain markers in the reservation records—such as a one-way journey or payment by cash—for closer scrutiny of luggage. Yet these same travelers, deemed risky by the CAPPS algorithms, were not screened any more carefully at passenger checkpoints and gate check-ins.

The September 11 hijackers had some of the risk markers, but they did not check luggage. CAPPS was deployed to find bombs hidden in suitcases, not to prevent hijackings—CAPPS is a specific countermeasure designed for a specific vulnerability.

It is possible that a back-up layering of these two security measures would have increased the chances of detecting and intercepting the September 11 hijackers. The combination also may have deterred the terrorists from targeting airlines. Finding ways to breach a multilayered security system and calculating the odds of success is far more complicated than finding ways to breach a single-perimeter defense.

Understanding what deters terrorists is crucial for designing effective and efficient security systems. It is important, for instance, to know how tactics such as random screening, clandestine policing, and surveillance can create layers of uncertainty—or "curtains of mystery"—that inhibit, as well as catch, would-be terrorists. Because the transportation sector is so large and is poorly suited to blanket protections, creative means of deploying resources to create uncertainty are crucial.

Today more interleaved layers and curtains of mystery are helping to secure air transportation—terrorists must wonder whether a more thorough inspection at a checkpoint will uncover their plot or if an air marshal will be aboard. Moreover, vigilant flight crews and passengers have detected suspicious activity. What is important, however, is that these layers of deterrence and protection are part of a deliberate strategy, purposefully placed. Otherwise, the layers of protection may fade over time.

Integrated Systems

Perhaps the best way to ensure that security systems remain dynamic and relevant is to build them into the systems used to operate and manage transportation and to make them mesh with other transportation system goals. Both the role played by Federal Aviation Administration's air traffic controllers in grounding aircraft just after the September 11 attacks and the forensic uses made of tracking codes imprinted on U.S. mail in investigating the anthrax mailings demonstrate dual-use opportunities.

The more that security measures promise to provide collateral benefits, the more likely they are to be maintained and improved. For example, a security system for shipping also may help reduce theft or loss of cargo, prevent the use of containers for moving drugs and other contraband, and assist carriers and shippers in tracking shipments. Quality experts in the U.S. manufacturing sector repeat the mantra, "You cannot inspect quality into a product." The same principle applies—security must be built in.

TSA's Strategic Role

Building layered and well-integrated security systems into all transportation modes will not be easy. It will require an understanding of the operations and characteristics of the systems for each mode. It also will require collaboration among the public- and private-sector owners, operators, overseers, and users of transportation systems in this country and abroad.

Although the federal government plays a large role in securing air transportation, it shares this responsibility with airports, airlines, and governments at the state and local levels and internationally. In the land and maritime modes of transportation, the responsibility is shared to an even greater extent.

In most cases, therefore, TSA's security role must be largely strategic, not hands-on. As the only national entity responsible for security in all the transportation modes, TSA is in a good position to provide the perspective and marshal the expertise needed to build comprehensive security systems and to bring together the parties that can make the systems work.

TSA should take the lead in designing transportation security systems through collaboration.

Many public, private, and foreign entities must field the systems that will make transportation more secure. Decentralization and dispersion, however, hinder the cooperative devising and deploying of system-level concepts. TSA can orchestrate the cooperation essential for building security into transportation operations.

Working with transportation system owners, operators, and users to explore alternative security concepts, TSA can become sensitive to implementation issues, from the economic to the societal. For instance, a more comprehensive and integrated CAPPS initiative for prescreening airline passengers may require the use of biometric cards and access to personal data, presenting not only technical challenges but also raising concerns about legality, privacy, and civil liberties.

Industry participants in a linked system of security will want assurance that they are not assuming

greater risk of liability or exposure of proprietary information if the security system fails. Some of these legal and institutional issues may constrain or preclude implementation but must be appreciated early, before resources are invested.

TSA should conduct and marshal research and development (R&D) in support of systems analysis.

Thinking of security in a systems context will reveal research and technology needs. One critical area for research is human behavior and performance. Human factors expertise and knowledge will be necessary for crafting layered security systems that as a whole raise the perceived risk of getting caught and maximize the ability of security personnel to recognize unusual and suspicious activity and behavior. Human factors expertise is essential for designing efficient and reliable security devices, facilities, and procedures that complement the skills of operators and security personnel.

TSA must have its own research capacity and the ability to tap expertise inside and outside the transportation community. In viewing R&D from a systems perspective, TSA can determine where investments may yield large benefits and can encourage investments. Much necessary research and technology development must take place in universities and research institutions and with support from sponsors such as the Department of Defense, the National Institutes of Health, and the National Science Foundation. By making the needs and parameters of transportation security systems more widely known, TSA can identify and shape research and technologies that are promising and relevant.

TSA should provide technology guidance, dissemination, and evaluation.

The public and private sectors are interested in developing and employing technologies for transportation security. For example, many are trying to develop sensors to detect the presence of chemicals and explosives. But how can sensors detect chemicals in a busy transportation setting with myriad background materials, providing a useful level of sensitivity and an acceptable rate of false alarms?

Much effort can be expended on developing technologies not suited to transportation settings or incompatible with overarching security systems. TSA should offer guidance to commercial developers on appropriate technological capabilities. TSA also should provide transportation system owners and operators with advice on technologies and processes, on dual-use benefits, and on opportunities to collaborate with researchers and technology developers.

National Academies Committee on Science and Technology for Countering Terrorism: Panel on Transportation

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Unconventional Thinking

September 11 demonstrated that terrorists are able to appropriate transportation systems and assets in ways difficult to conceive, that can be overlooked in day-to-day efforts to ensure transportation security. Transportation systems are regulated at the mode-specific level, and the entities that own and use them are organized for the efficient provision of specific services. Terrorists, however, are seeking to exploit new threats and may view individual transportation assets, infrastructure, and services not in self-contained and functionally oriented ways, but as components and tools of other systems, as they used jet airliners as weapons last fall.

A broader-based understanding of terrorist threats that involve transportation and of how to respond to the threats is needed. A national entity outside normal organizational settings with a sole mission to explore and assess terrorist threats, probable responses, and consequences could help meet this critical need. This entity could offer a window into the mind and methods of the terrorist, to help keep U.S. transportation systems from being exploited again so tragically.

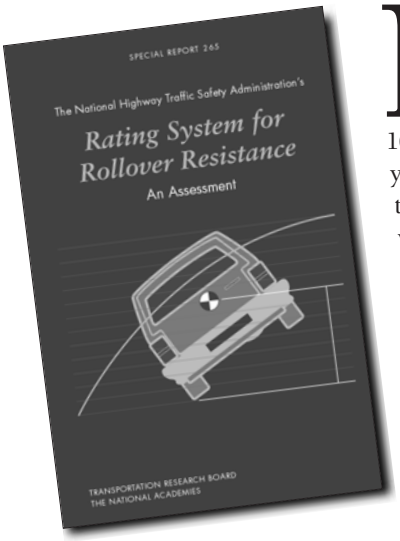
A longer version of this article can be found in Issues in Science and Technology, *Summer 2002.*

NEW TRB SPECIAL REPORT

The National Highway Traffic Safety Administration's Rating System for Rollover Resistance

An Assessment

JILL WILSON



Special Report 265: The National Highway Traffic Safety Administration's Rating System for Rollover Resistance: An Assessment is available from TRB (see Publications Order Form in this issue).

Motor vehicle rollovers involving passenger cars, vans, pickup trucks, and sport utility vehicles (SUVs) result in approximately 10,000 deaths and 27,000 serious injuries each year in the United States. Rollovers occur in fewer than 1 in 10 tow-away crashes involving light vehicles[1] but account for almost one-third of light-vehicle occupant fatalities.

The risk of death or injury is particularly high in single-vehicle rollovers. Of the 8,345 people killed in single-vehicle rollovers in 1999, 80 percent were not using a seat belt, and 64 percent were ejected from the vehicle.

All automobile crashes are complex but involve three main interacting factors: the driver, the driving environment (e.g., weather and road conditions, time of day), and the vehicle. Reductions in the number of deaths and in the number and severity of injuries associated with rollover therefore would likely result from

- Changes in driver behavior—notably increased seat belt use;
- Design improvements in roadsides and roadside structures, particularly in rural areas; and
- Vehicle modifications to reduce the likelihood of rollover and to provide additional protection of occupants.

The TRB Committee for the Study of a Motor Vehicle Rollover Rating System (see box on page 32), appointed at the request of the U.S. Congress, was charged with investigating the potential role of vehicle characteristics and related consumer information in reducing the number of rollover crashes. *Special Report 265: The National Highway Traffic Safety Administration's Rating System for Rollover Resistance: An Assessment*, released in April 2002, presents the committee's findings and recommendations to the National Highway Traffic Safety Administration (NHTSA) for developing consumer information on motor vehicle rollover to (*a*) assist the public in choosing safer cars and (*b*) encourage manufacturers to investigate ways of making vehicles less susceptible to rollover.

[1] Passenger cars and multipurpose passenger vehicles under 10,000 pounds gross weight.

Star Ratings

NHTSA has developed a five-star rating system to inform consumers about the rollover resistance of light vehicles. A five-star rating indicates the highest resistance to rollover, with one star the lowest. Most 2001-model SUVs received two- or three-star ratings; most passenger cars received four or five stars. The ratings—incorporated into NHTSA's New Car Assessment Program—provide an estimate of the probability of rollover in a single-vehicle crash but do not predict the likelihood of a crash or the type or severity of injuries.

NHTSA's rollover resistance rating depends on a vehicle's static stability factor (SSF)—the track width divided by twice the center-of-gravity height (see Figure 1). According to the agency's analyses of 220,000 single-vehicle crashes, taller, narrower vehicles, such as SUVs, are more likely to roll over than lower, wider vehicles, such as passenger cars, after contact with a mechanical obstacle such as a curb or other surface irregularity. NHTSA's rollover resistance rating system is based on a statistical correlation between SSF and the probability of rollover in a single-vehicle crash, as determined from crash data.

The study committee's charge was to investigate whether SSF is a "scientifically valid measurement that presents practical, useful information to the public," and to compare the SSF with "rollover metrics

based on dynamic driving conditions that may induce rollover events" (Public Law 106–346). The committee undertook investigations in three subject areas: vehicle dynamics, crash data analysis, and consumer information.

Vehicle Dynamics

Vehicle rollover has been investigated using both static and dynamic testing. Static testing, performed in the laboratory, involves measuring vehicle parameters or testing entire vehicles and then correlating the data with rollover propensity. Dynamic testing is performed on a test track and is helpful in understanding the events preceding rollover but is expensive and requires safety precautions for the test drivers. Moreover, repeatability may be difficult to achieve.

The committee determined that SSF—which relates easily measured vehicle parameters to the level of sustained lateral acceleration that leads to rollover—is an indicator of vehicle rollover propensity and is preferable to other static measures. The concern, however, is that SSF does not address the reason a vehicle starts sliding sideways or whether a vehicle would have remained under control if equipped with a stability control system.

SSF therefore cannot yield an understanding of a rollover crash from initiation to final outcome—dynamic testing is required to understand how the handling characteristics of a vehicle affect the driver's ability to maintain control in an emergency. In particular, dynamic testing may discriminate among vehicles with similar SSF but a different likelihood of encountering out-of-control situations that result in rollover.

Because of the diversity of dynamic tests and the need to test near the limits of vehicle performance, the development of one or more dynamic rollover tests requires complex choices and extensive evaluation. A suitable dynamic test protocol should make it possible to segregate driver or vehicle systems susceptible to loss of control from those that are more robust.

Crash Data Analysis

The crash data files NHTSA used to develop the rollover resistance rating system include information on driver characteristics and road conditions. This allows the definition of different crash scenarios associated with different risks of rollover. For example, scenarios involving drivers under age 25 or drivers who have been drinking alcohol carry a relatively high risk of rollover, as do scenarios involving inclement weather or curves in the road. A critical question is the extent to which a vehicle's SSF value affects the risk of rollover for different drivers and driving environments.

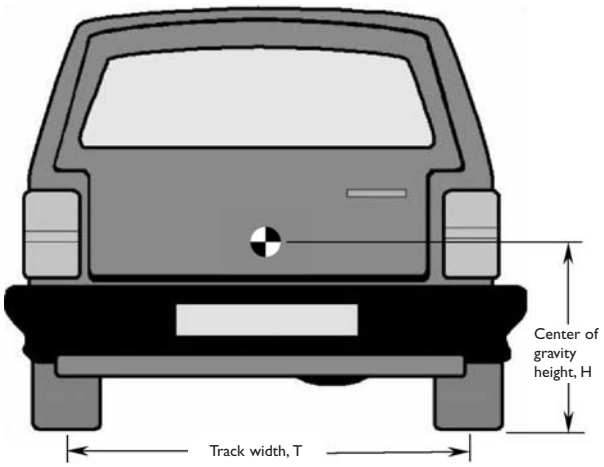


FIGURE 1 Important dimensions for static stability factor (SSF = T/2H).

Analysis of crash data reveals that, for higher-risk scenarios, SSF correlates significantly with single-vehicle rollovers, although driver behavior and the driving environment also contribute. For these scenarios, the statistical trends in crash data and the underlying physics of rollover are consistent in showing that an increase in SSF reduces the likelihood of rollover.

NHTSA derived its star ratings from an average rollover propensity curve, calculated using an exponential statistical model and regression analysis of single-vehicle crash data from six states. The five rating categories were obtained by partitioning the curve based on the probability of rollover in a single-vehicle crash.

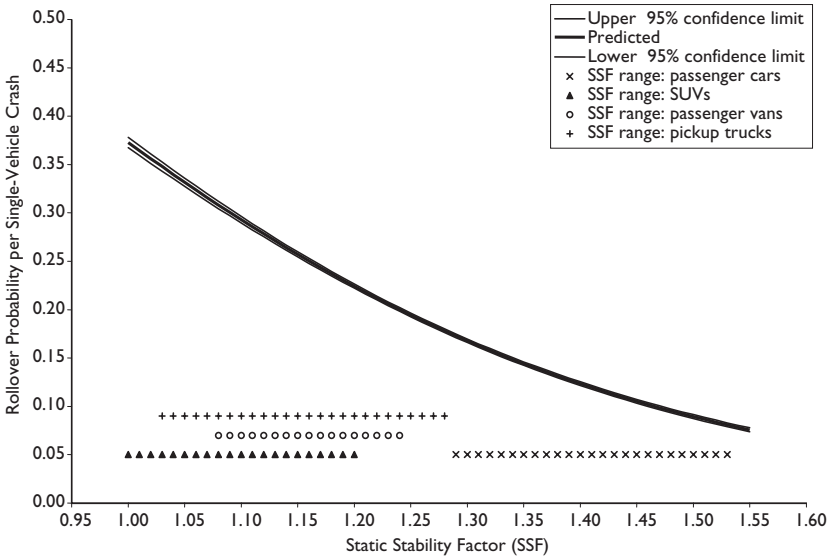


FIGURE 2 Estimated probablility of rollover and 95 percent confidence intervals based on maximum-likelihood estimation of a logit model using the data from six states combined (*n* = 206,822).

Committee for the Study of a Motor Vehicle Rollover Rating System

David N. Wormley, The Pennsylvania State University, Chair

Karin M. Bauer, Midwest Research Institute, Kansas City, Missouri

James E. Bernard, Iowa State University, Ames

Ann Bostrom, Georgia Institute of Technology, Atlanta

Susan A. Ferguson, Insurance Institute for Highway Safety, Arlington, Virginia

B. John Garrick, NAE, Independent Consultant, Laguna Beach, California

Paul A. Green, University of Michigan Transportation Research Institute, Ann Arbor

David L. Harkey, University of North Carolina Highway Safety Research Center, Chapel Hill

J. Karl Hedrick, University of California at Berkeley

David C. Holloway, University of Maryland, College Park

L. Daniel Metz, Metz Engineering and Racing, Champaign, Illinois

N. Eugene Savin, University of Iowa, Iowa City

Kimberly M. Thompson, Harvard School of Public Health, Boston, Massachusetts

The committee found that the relationship between rollover risk and SSF can be estimated accurately with available crash data and software using a logit statistical model, which is more appropriate than the exponential model used by NHTSA (see Figure 2). Approximating the rollover curve with five discrete levels also does not convey the full information from the available crash data. At lower SSF values, the rollover curve is relatively steep, producing a wide variation in SSF within a rating category. As a result, two SUVs may have differences in SSF and rollover propensity but the same star rating. The rating system therefore is not as helpful as it could be to a consumer.

Consumer Information

User statistics indicate that the rollover information on NHTSA's website has attracted interest. However, empirical data on consumer use of the ratings are not available. Therefore in assessing the ratings for "practical, useful information to the public," the committee focused on the process used in developing the rollover rating system.

The committee noted a gap between NHTSA's process and recommended practices for identifying and meeting consumer safety information needs. In particular, NHTSA relied on focus group studies that were limited in scope, and it did not undertake empirical studies to evaluate how consumers use the rating system in making vehicle safety judgments or purchase decisions.

Response to Congress

The committee developed two summary findings:

1. SSF captures important vehicle characteristics related to rollover propensity and is strongly correlated with the outcome of actual crashes. However, data from dynamic testing could provide important complementary information on vehicle crash-avoidance metrics.

2. NHTSA's star ratings for rollover resistance are likely to be of limited practical use to the public because of

– Shortcomings in the methodology used to produce the average rollover curve;

– The inadequacy of the five discrete rating categories in conveying vehicle differences indicated by the available crash data; and

– The limited procedures used in developing and evaluating the star rating system.

Future Approach

In accordance with the Transportation Recall Enhancement, Accountability, and Documentation Act, NHTSA is investigating several driving maneuver tests for rollover resistance. The committee recommended that NHTSA vigorously pursue this research to develop one or more dynamic tests to assess transient vehicle behavior leading to rollover. In the longer term, the agency should revise consumer information on rollover, incorporating dynamic test results to complement the information from static measures such as SSF.

The committee also recommended that NHTSA investigate alternative options for communicating information to the public on SSF and rollover. In revising the consumer information, NHTSA should

- Use a logit statistical model as a starting point for analyzing the relationship between rollover risk and SSF;
- Consider a higher-resolution representation of the relationship between rollover risk and SSF than the current five-star rating system;
- Continue to investigate presentation metrics other than stars; and
- Provide consumers with more information placing rollover risk in the context of motor vehicle safety.

Jill Wilson is Senior Program Officer, TRB Division of Studies and Information Services, and served as study director for this project.

CALENDAR

TRB Meetings

2002

October

27–30 3rd National Transportation Finance Conference
Chicago, Illinois
Claire Felbinger

27–30 11th International High-Occupancy Vehicle Conference
Seattle, Washington
Richard Cunard

27–30 15th National Conference on Rural Public and Intercity Bus Transportation
Huron, Ohio
Peter Shaw

November

7–10 5th Rail Passenger Caucus (by invitation)
Montreal, Canada
Peter Shaw

11–15 Remote Sensing and Spatial Information Technologies for Transportation Conference* (during Pecora/Land Satellite Information in the Next Decade)
Denver, Colorado
Thomas Palmerlee

17–20 First International Conference on Scour of Foundations*
College Station, Texas
G. P. Jayaprakash

18–19 Global Forum on the Maritime Transportation of Energy*
Houston, Texas
Joedy Cambridge

20–21 Drowsy Driving Summit (by invitation)
Washington, D.C.
Richard Pain

December

3–7 ARTBA 2nd International Conference on Work Zone Safety*
Orlando, Florida
Frank Lisle

2003

January

12–16 TRB 82nd Annual Meeting
Washington, D.C.
Mark Norman

March

17–19 National Asphalt Pavement Conference: Superpave 2003*
Nashville, Tennessee
Frederick Hejl

April

6–10 9th Application of Transportation Planning Methods Conference
Baton Rouge, Louisiana
Kimberly Fisher

28–30 9th International Bridge Management Conference
Orlando, Florida
Frank Lisle

May

18–21 Statewide Transportation Planning Conference
Florida Keys, Florida
Kimberly Fisher

June

22–25 8th International Conference on Low-Volume Roads
Reno, Nevada
G. P. Jayaprakash

July

Joint Summer Meeting of the Planning, Economics, Finance, Freight, and Management Committees
Portland, Oregon
Kimberly Fisher

28th Annual Summer Ports, Waterways, Freight, and International Trade Conference
Portland, Oregon
Joedy Cambridge

11 Data Analysis Working Group Forum on Pavement Performance Data Analysis
Guimarael, Portugal
A. Robert Raab

15–18 10th AASHTO/TRB Maintenance Management Conference*
Duluth, Minnesota
Frank Lisle

20–23 42nd Annual Workshop on Transportation Law
New Orleans, Louisiana
James McDaniel

23–26 Highway Capacity and Quality of Service Committee Midyear Meeting and Conference
Buckhead, Georgia
Richard Cunard

27–30 2nd Urban Street Symposium
Anaheim, California
Richard Cunard

September

8–10 International Conference on Pavement Performance, Data Analysis, and Design Applications*
Columbus, Ohio
G. P. Jayaprakash, Stephen Maher, Frederick Hejl

November

16–18 9th National Light Rail Transit Conference*
Portland, Oregon
Peter Shaw

Additional information on TRB conferences and workshops, including calls for abstracts, registration and hotel information, lists of cosponsors, and links to conference websites, is available online (www.TRB.org/trb/calendar). Registration and hotel information usually is available 2 to 3 months in advance. For information, contact the individual listed at 202-334-2934, fax 202-334-2003, or e-mail lkarson@nas.edu/.

*TRB is cosponsor of the meeting.

Nazih K. Haddad

Florida High-Speed Rail Authority

"Research has shown that we need to focus on achieving balanced transportation systems and include modes of travel that work together to provide an efficient intermodal transportation network," says Nazih K. Haddad, Staff Director of the Florida High-Speed Rail Authority. As a proponent of intermodal travel, Haddad has worked in various capacities on every high-speed rail and maglev study, plan, and proposal undertaken in Florida since 1988.

Haddad currently manages all executive functions and major activities for Florida's High-Speed Rail Authority, including the environmental and engineering assessments necessary to satisfy the federal environmental process, as well as the market and ridership studies. He also manages the development of the request for proposals for a design, build, operate, maintain, and finance contract for implementation of the first segment of the high-speed rail system between Orlando and Tampa.

"Research has shown that we need to focus on achieving balanced transportation systems and include modes of travel that work together to provide an efficient intermodal transportation network."

"The need for implementation of high-speed rail systems in Florida has been well established," asserts Haddad. "Statistics provide a clear picture of the tremendous increase in intercity travel demand, coupled with a limited increase in the supply of intercity transportation facilities around the state."

Haddad has played an instrumental liaison role with the Florida legislature, the governor's office, and Florida's congressional delegation. The Florida legislature recently approved findings concluding that implementation of high-speed rail service in the state would result in significant transportation, economic, social, and environmental benefits, and that public use of high-speed rail systems should be encouraged.

Over the course of his career, Haddad has been a leader of many successful projects for Florida's High-Speed Rail Authority, Department of Transportation (DOT), and High-Speed Rail Transportation Commission. Between 1999 and 2001, he was responsible for establishing a partnership—among Amtrak, Florida East Coast Railway, local communities, and Florida DOT—for implementation of an $84 million project to bring Amtrak's intercity passenger rail service to Florida's east coast communities.

Haddad was involved in the development of the magnetic levitation technology projects Maglev 2000 in Titusville and American Maglev Technology in Edgewater. He was project director for the Florida Magnetic Levitation Demonstration Project to link the Orlando Airport with International Drive and Disneyland using the German Transrapid maglev technology; the project was terminated in 1992 when technology providers and the project's private sponsors were unable to reach agreement.

In the early 1990s, Haddad was project manager for several high-speed rail studies, including Florida DOT's High-Speed Rail Ridership Study and corridor studies and for the Coast-to-Coast Rail Feasibility Study—completed on time and $200,000 under budget. Applying experience working with the investment banking community, bond-rating agencies, and Florida's Division of Bond Finance to study financial aspects of the Florida High-Speed Rail Project, Haddad collaborated with Florida DOT to develop innovative financing mechanisms for major transportation infrastructure projects. The work led to Congressional enactment of the Transportation Infrastructure Finance and Innovation Act.

Haddad has participated in several TRB activities on rail transportation for many years: he has been a member of the Committee on Intercity Rail since 1992 and currently serves as Vice Chair. He was a member of the committees on Guided Intercity Passenger Transportation, Safety Research Related to High-Speed Rail and Maglev Passenger Systems, Review of the Federal Railroad Administration Research and Development Program, and an Assessment of Federal High-Speed Ground Transportation Research and Development—which issued several reports to Congress on the status and adequacy of programs administered by the Federal Railroad Administration.

In his other professional affiliations, Haddad served as an associate member of the High-Speed Ground Transportation Rail Association and a past chairman of American Society of Civil Engineers' High-Speed Ground Transportation Committee.

Licensed by the Florida Board of Professional Engineers, Haddad received a bachelor's degree in civil engineering from the University of Florida and a master's degree in business administration from Florida State University.

Hank E. Dittmar

Great American Station Foundation

Hank E. Dittmar, President and Chief Executive Officer of the Great American Station Foundation, headquartered in Las Vegas, New Mexico, fosters community economic development by revitalizing rail stations and by promoting transit-oriented development (TOD).

"Our organization is conducting case-study research into successful TOD and investigating TOD's financial performance, traffic and parking generation, and place-making attributes," he reports. "We are developing a TOD taxonomy that correlates land use densities, transit service levels, and urban design characteristics with different scales in the evolving metropolitan structure."

For more than 20 years, Dittmar has been instrumental in developing and advocating regional and national policies on transportation and the environment, metropolitan sprawl, transit- and pedestrian-oriented development, and community revitalization. During the Clinton Administration, he was appointed to the White House Advisory Committee on Transportation and Greenhouse Gas Emissions and chaired the Metropolitan Working Group of the President's Council on Sustainable Development. Currently Dittmar is cochair of the Center for Neighborhood Technology and a board member of the Congress for the New Urbanism and the Surface Transportation Policy Project.

"Transportation is a means, not an end in itself, and it is important for research institutions to hear a variety of voices about the ultimate goals of transportation in terms of the economy, the individual, the environment, public health, and social equity."

"I look forward to the next few years in transportation research," he notes. "I think we are seeing a change in the demands that elected officials and the general public are going to place on transportation officials—no longer are we going to operate in modal silos, and no longer will we be able to argue that if we had more money for infrastructure and research the problems will go away."

He points to specific challenges and a role for research: "Our problems with congestion, air quality, and public health are proving intractable, and the public will demand better performance and more integration. It will be up to the research community to develop the performance measures to set us on that track."

From 1993 to 1998, Dittmar was executive director of the Surface Transportation Policy Project, a national coalition for transportation reform. He served as the manager of legislation and finance at the San Francisco Bay Area Metropolitan Transportation Commission, as director of the Santa Monica (California) Airport, and as a senior analyst for the Santa Monica bus lines.

Active with the Transportation Research Board (TRB), Dittmar has served on a variety of committees and project panels, including the Transit Cooperative Research Program project panels on transit policy research, on the role of transit in creating livable metropolitan communities, and on combating global warming through sustainable surface transportation policy. He also has participated on the Research and Technology Coordinating Committee (Highways) and on the committees for a study for a future strategic highway research program and for the evaluation of the congestion mitigation and air quality improvement program.

"Participation in TRB study committees has been both a particularly challenging endeavor and a rewarding one for me," he reflects. "The process of using research and evidence to bring people of diverse backgrounds and opinions towards consensus is fascinating and worthwhile."

Dittmar adds, "Transportation is a means, not an end in itself, and it is important for research institutions to hear a variety of voices about the ultimate goals of transportation in terms of the economy, the individual, the environment, public health, and social equity."

Dittmar's professional work has been recognized with awards from diverse organizations, including the National Trust for Historic Preservation, the American Society for Public Administration, the Women's Transportation Seminar, and the Aircrafts Owners and Pilots Association.

He is a member of the editorial boards of the *Journal of Transportation and Statistics* and the *Journal of the American Planning Association*, and he has authored several recent articles, including "ISTEA and the New Era in Transportation Policy," "Sprawl, the Automobile and Affording the American Dream," and "Will September Eleventh Bring Us Together or Push Us Apart? The War on Terror and Metropolitan Structure." He has also contributed to *The New Transit Town* (forthcoming, 2003).

Dittmar holds a master's degree in community and regional planning from the University of Texas, Austin, and a bachelor's degree from Northwestern University.

Positive Systems

Images taken from space allow analysts to identify potential security vulnerabilities.

Data from Space May Bolster Transportation Security

Data from space-based observation systems can assist in protecting the nation's transportation infrastructure from terrorist attacks, according to a report, "Remote Sensing for Transportation Security," released in August by the Space Policy Institute at the Elliott School of International Affairs, George Washington University (GW).

"Identifying and reducing vulnerabilities through the use of remote sensing technologies would help security professionals protect our vast transportation system," said Ray Williamson, Research Professor at the Space Policy Institute. "Our recommendations to the U.S. DOT call for establishing interoperability standards for remote sensing transportation information, which will then be utilized by security officials at the federal, state, and local levels."

The report is the product of a workshop convened at GW by the National Consortium for Safety, Hazards, and Disaster Assessment for Transportation Lifelines (NCRST-H) to assist transportation officials in meeting the threat of terrorist activities. At the workshop, experts in transportation, remote sensing, and other geospatial technologies explored issues related to the protection of critical transportation infrastructure and identified potential applications for the technology. Follow-up workshops will focus on specific elements of the nation's transportation infrastructure.

Remote sensing includes three applications: from space, allowing analysts to examine changes in surface features; from aircraft, showing areas in detail; and from the ground, offering detailed "real-time" observation.

NCRST-H comprises researchers at the University of New Mexico's Earth Data Analysis Center, the University of Utah's Center for Natural Technological Hazards and DIGIT Lab, GW's Space Policy Institute and Department of Geography, and Oak Ridge National Laboratory's Center for Transportation Analysis. The U.S. DOT's Research and Special Programs Administration provides substantial funding.

For a copy of the report, contact Ryan Carter (telephone 202-994-7292) or go to the website, www.gwu.edu/~spi/.

Report Pulls for Passenger Rail

The National Association of Railroad Passengers (NARP) has issued a report, "Modern Passenger Trains: A National Necessity—Analysis and Recommendations," recommending a new approach to upgrading and expanding the nation's "largely neglected" rail system to "21st century standards" to provide "a real travel choice for Americans." Key recommendations include

- Creating a "long-range vision for an expanded intercity rail network that connects all regions and metropolitan areas of the country and serves all important transportation routes," with funding partly through a rail trust fund.
- Giving Amtrak an emergency grant to ensure maintenance of all current routes and services and "repair and return to service [of] all passenger rolling stock now idled."
- Transferring ownership—but not control—of Amtrak infrastructure to the U.S. Department of Transportation (DOT), which would be "responsible for funding the maintenance and development of these assets as publicly owned facilities to support" all forms of rail service.
- Mandating that "Amtrak's Board of Directors be appointed to represent all regions" and include "elected officials, business leaders, and consumers."

Improving and expanding all types of intercity passenger rail services.

- Focusing debate "on strategies that will allow rail to realize its full potential in serving public needs, not on ones that seek only to reduce further—or eliminate entirely—federal support of intercity rail service."

According to NARP's report, "Even though public use of Amtrak's existing trains is high, lack of adequate capital funding over the three decades of Amtrak's existence has greatly limited its ability to satisfy the nation's growing demand for transportation…."

For more information, visit www.narpail.org/.

Bridge Rebuilt in Record Time

Innovative contracting measures and construction techniques, as well as successful coordination among Oklahoma DOT, U.S. DOT, and private-sector contractors has reopened the I-40 Bridge in eastern Oklahoma in record-setting time—65 days instead of the usual 6 months. The bridge, which crosses the Arkansas River near Webbers Falls, Oklahoma, was struck on May 26 by a barge that had veered several hundred feet from the river's navigational channel, collapsing 4 bridge spans and killing 14 people.

Oklahoma DOT asked contractors to submit A+B bids. Contractors bid on (A) the work and (B) how soon they believe they can complete the work. Incentive–disincentive provisions in the hourly contract also expedited construction.

A technology that uses computer chips to measure the temperature and strength of the concrete kept engineers informed of any irregularities that occurred during construction. Other innovations included precast concrete and heat-straightening to repair damaged steel girders. The repair process applied a limited amount of heat in specific patterns to the deformed regions of damaged steel in repeated heating and cooling cycles, gradually straightening the material.

"The success of the innovative approaches sends an important signal to all Americans that our nation has the ability to make immediate repairs to our road and bridge system that minimize economic impacts and provide needed mobility and safety to motorists." said Mary Peters, head of the Federal Highway Administration (FHWA).

Construction on I-40 Bridge in Webbers Falls, Oklahoma, was expedited using new technologies and innovative contracting measures.

INTERNATIONAL NEWS

Institute Makes Inroads in Mongolia

The American Concrete Institute (ACI) has exported its certification program to Mongolia, where eight students have passed certification tests for ACI Concrete Field Testing Technician–Grade I. ACI conducted two certification sessions in the past year, one in the capital city of Ulaanbaatar and the second in Darkhan.

ACI Examiner M. R. Hansen, a professor at the South Dakota School of Mines and Technology, spearheaded the certification sessions through a university exchange program. Since his curriculum incorporates ACI Concrete Field Testing Technician–Grade I certification, Hansen approached ACI to arrange for delivery of exam materials to Mongolia.

The language barrier was the biggest hurdle. "The Mongolian students could read and write well in English, but they had difficulty speaking the language," Hansen says. "I spent quite a bit of time explaining the technical terminology."

Hansen sees the ACI certification as an important step in improving the quality of concrete in Mongolia. "Mongolia is about 50 years behind the United States in terms of construction methods and technology," he explains. "Virtually no construction standards are in place now."

During a yearlong stay in Mongolia, Hansen and Southern Illinois University–Edwardsville Engineering Professor Luke Snell formed a Mongolian chapter of ACI and conducted the First Annual Mongolian Concrete Conference. Hansen plans to return in June 2003 to administer additional certification exams, with the recently certified students handling the preliminary instruction.

For more information, contact John Nehasil (telephone 248-848-3788 or e-mail John.Nehasil@concrete.org) or visit www.concrete.org/.

M. R. Hansen (*center*) prepares to demonstrate the unit-weight test to a group of Mongolian students.

PEOPLE IN TRANSPORTATION

Marion C. Blakey

New Administrator for Nation's Airways

Marion C. Blakey, former Chairman of the National Transportation Safety Board (NTSB) and past Administrator of the National Highway Traffic Safety Administration (NHTSA), was sworn in as the Federal Aviation Administration's (FAA) 15th Administrator on September 13, 2002. She will be responsible for regulating and advancing the safety of the nation's airways and for operating the world's largest air traffic control system.

Blakey moves from NTSB, where she managed accident investigations, including the crash of American Airlines Flight 587. At NTSB, she improved the accident reporting process, increased industry and regulatory responsiveness to safety recommendations, strengthened advocacy and outreach programs to promote safer travel in all modes of transportation, and furthered development of the NTSB Academy as a national and international resource to enhance aviation safety and accident investigations.

From 1992 to 1993, Blakey served as NHTSA Administrator, after holding key positions at the Department of Commerce, the Department of Education, the National Endowment for the Humanities, and the White House. Blakey also has received four previous Presidential appointments.

From 1993 to 2001, she was the principal of Blakey & Associates, a Washington, D.C., public affairs consulting firm focusing on transportation issues and traffic safety.

Blakey received a bachelor's degree with honors in international studies from Mary Washington College of the University of Virginia and attended Johns Hopkins University, School of Advanced International Studies, for graduate work in Middle East Affairs.

As FAA Administrator, Blakey becomes an ex officio member of the Transportation Research Board's Executive Committee.

Public Comment Sought on Future Surface Transportation Programs

U.S. Secretary of Transportation Norman Y. Mineta has invited individuals and groups to participate as the U.S. DOT prepares a proposal to Congress on reauthorization of the nation's surface transportation programs. An Internet-based site is open for submission of comments, ideas, and analyses. Comments also can be submitted in writing.

The Transportation Equity Act for the 21st Century (TEA-21), which took effect in June 1998, expires in September 2003. A U.S. DOT informational brochure, "America's Surface Transportation Programs: Meeting the New Challenges," includes a list of TEA-21 accomplishments, core principles for reauthorization, and information on how individuals and groups can participate in shaping the surface transportation programs. The brochure and the *Federal Register* notice requesting comments on reauthorization are posted on the U.S. DOT website.

To submit comments online, visit www.dot.gov/ (click on Surface Transportation Reauthorization); send written comments to Docket Clerk, U.S. DOT, Room PL-401, Docket Number OST-2002-12170, 400 Seventh Street, SW, Washington, DC 20590.

You've Got Mail—From U.S. DOT

A new electronic notification service is now available for people who want to follow U.S. DOT regulatory activities. The U.S. DOT initiative sends an e-mail alert to registered users each time a government document is posted on the Internet in the docket management system, which makes rulemakings, adjudication documents, and public comments electronically accessible to the public.

Users can register to receive notifications of (*a*) specific rulemakings or proceedings by regulatory identification number, docket number, or operating administration and (*b*) options that have a federal, tribal, or small business impact.

To register or for more information, visit http://dms.dot.gov/.

IN MEMORIAM

George H. Way, Jr.,
1930–2002

George Way, former Vice President for Research and Test at the Association of American Railroads (AAR), died in June. An ex officio member of the TRB Executive Committee for almost seven years, Way began his involvement in TRB in 1975, when he served as AAR liaison member to the TRB Committee for the Railroad Research Study, funded by AAR and the Federal Railroad Administration.

The study committee analyzed issues and problems confronting the railroad industry, reviewed the state of railroad research, and assessed research needs. One outcome was the creation of TRB's first railroad-related standing committees in 1976. Way served as a member of several TRB technical committees and eventually chaired the Railway System Section.

He spent nearly two decades in AAR's Research and Test Department, working closely with department head William J. Harris, Jr., to expand the program, leading to the creation of the Transportation Technology Center, Inc. Before joining AAR, Way worked in the research department of the Chesapeake and Ohio Railroad and in the Pennsylvania Railroad engineering department.

2002 Associates To Be Announced by National Academies

The National Associates of the National Academies program recognizes extraordinary contributions to the National Academies through *pro bono* service to National Research Council and Institute of Medicine programs.

Individuals recognized have served with distinction on committees of the National Academies. Membership in the Associates is for life, and new designations will be made annually. This year's National Associates will be announced in December.

The following TRB veterans were recognized in the 2001 class of National Associates:

H. Norman Abramson
Lillian C. Borrone
Dwight M. Bower
L. G. (Gary) Byrd
Anne P. Canby
E. Dean Carlson
Ray Chamberlain
Joseph M. Clapp
John A. Clements
Lawrence D. Dahms
Thomas B. Deen
Charles E. Dougan
John W. Fisher
David J. Forkenbrock
Francis B. Francois
Louis J. Gambaccini
John Gray
William J. Harris, Jr.
Lester A. Hoel
Lowell B. Jackson
Thomas D. Larson
Adolf D. May, Jr.
Michael D. Meyer
Joseph A. Mickes
William W. Millar
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Wayne Muri
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Cooperative Research Programs News

Test Methods To Improve Aggregate Specifications

The particle shape, texture, and angularity of coarse and fine aggregates used in hot-mix asphalt and hydraulic cement concrete and unbound base and subbase layers have significant effects on pavement system performance. These properties vary widely with the type and source of aggregates and processing techniques. Current aggregate specifications do not directly address the measurement of these properties, causing inconsistent interpretation and use of the test results.

Washington State University at Pullman has been awarded a $499,987, 24-month contract (NCHRP Project 4-30, FY 2002) to identify or develop—for use in central and field laboratories—suitable test methods for measuring shape, texture, and angularity characteristics of aggregates used in hot-mix asphalt and hydraulic cement concrete and unbound base and subbase layers of highway pavements. These test methods will help highway agency personnel improve specifications for aggregates used in highway pavements.

For further information contact Amir N. Hanna, TRB (telephone 202-334-1892, e-mail ahanna@nas.edu).

How Do Design and Construction Features Influence Pavements?

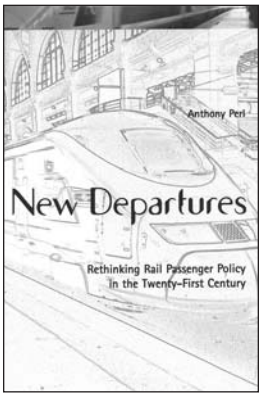
For specific site conditions—traffic level, climatic conditions, and subgrade type—the response and performance of flexible and rigid pavements depend not only on pavement layer thickness and material properties, but also on other design and construction features, including type and details of subdrainage, base, and shoulders.

Although based on limited analysis, recent research has documented the effects of these features on pavement response (measured by deflection and strain) and performance (measured by type and extent of distress or smoothness). Further research is needed to enhance understanding of the effects of these features on pavement response, determine their relative importance, and establish their contributions to achieving different levels of performance.

The data available from the Long-Term Pavement Performance studies, including instrumented Specific Pavement Studies' test sections in Ohio and North Carolina, are expected to provide information needed for a more rigorous analysis.

Michigan State University of East Lansing has been awarded a $299,301, 24-month contract [NCHRP Project 20-50(10/16), FY 2002] to determine (1) the pavement response effects of design and construction for specific site conditions and (2) the contributions of design and construction features to achieving different levels of performance. The research will be limited to new (nonrehabilitated) flexible and rigid pavements; the findings will provide preliminary information on the relationship between pavement response and performance, guidance for identifying appropriate features for different pavement types, and recommendations for improving data collection activities.

For further information contact Amir N. Hanna, TRB (telephone 202-334-1892, e-mail ahanna@nas.edu).

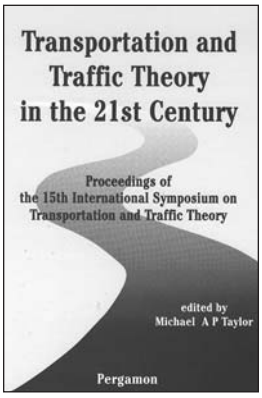


New Departures: Rethinking Rail Passenger Policy in the Twenty-First Century

Anthony Perl. The University Press of Kentucky. Lexington, Kentucky: 2002; $29.95, hardcover; ISBN 0-8131-2211-2; 334 pp.

Examining how policy makers shaped the success and shortcomings of European and Japanese high-speed rail service, this book provides useful background for the continuing debate over Amtrak's future, along with solutions for the rail carrier's long-term financial stability. The author considers the implications of the foreign experiences within the North American institutional and political context and describes the obstacles to renewing passenger rail in North America.

After reviewing several false starts on high-speed rail in the United States, the author highlights two key choices that must be made about the future of passenger service in the United States and Canada: whether public or private organizations will take the lead and whether efforts will be pursued at the national or state level. The author suggests several scenarios for policy innovations that could improve rail passenger services.



Transportation and Traffic Theory in the 21st Century: Proceedings of the 15th International Symposium on Transportation and Traffic Theory

Pergamon. M. A. P. Taylor, ed. Kidlington, Oxford: 2002; $217, hardcover; ISBN: 0-08-043926-8; 730 pp.

This formal proceedings of a symposium held at the University of South Australia in July 2002 presents the international state of the art in traffic and transport research. Topics include traffic flow theory, traffic management, and traffic control; intelligent transport systems; analytical techniques for road safety; travel demand modeling, including dynamic traffic assignment, route control, and congestion pricing; environmental impact analysis for transport systems; public transport planning, service design, and operations; freight transport modeling; logistics and supply chain modeling; and pedestrians and bicycles.

The books listed in this column are not TRB publications. For ordering information, contact the publisher listed.

TRB Publications

Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects

NCHRP Report 466

The desk reference and its companion slide presentation (available online as *NCHRP Web Document 43*) provide guidance and a framework for practitioners defining and analyzing the indirect effects of proposed transportation projects. A continuation and update of the research published as *NCHRP Report 403: Guidance for Estimating the Indirect Effects of Proposed Transportation Projects*, this Report also presents improved tools for practitioners, analyzes historical case studies for retrospectives on indirect effects, and offers new training materials.

2002; 99 pp.; TRB affiliates, $12.75, nonaffiliates, $17. Subscriber categories: planning and administration (IA); energy and environment (IB); transportation law (IC); highway and facility design (IIA); aviation (V); public transit (VI); rail (VII); freight transportation (VIII); marine transportation (IX).

Performance Testing for Modular Bridge Joint Systems

NCHRP Report 467

Details are presented on the research methods used to develop (*a*) recommended performance requirements for modular bridge joint systems and (*b*) test methods and test equipment for the prequalification and acceptance of the systems. Recommended performance test specifications; materials, fabrication, and construction guidelines; and an anchorage design example are presented. Many of the recommended guidelines are applicable to strip seals.

2002; 84 pp.; TRB affiliates, $12.75; nonaffiliates, $17. Subscriber category: planning and administration (IA).

Fatigue-Resistant Design of Cantilevered Signal, Sign, and Light Supports

NCHRP Report 469

Design examples show application of the fatigue provisions in AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals* (2001). The Report offers guidance on the design, installation, inspection, and maintenance of the structures and on the recommended specifications for anchor rods. The loads resulting from variable-message signs and methods for mitigating galloping effects, tightening anchor bolts, and identifying structures and sign configurations susceptible to galloping are examined.

2002; 268 pp.; TRB affiliates, $27; nonaffiliates, $36. Subscriber categories: bridges, other structures,

and hydraulics and hydrology (IIC); materials and construction (IIIB).

Evaluation of Roadside Features to Accommodate Vans, Minivans, Pickup Trucks, and 4-Wheel Drive Vehicles
NCHRP Report 471
The Report relays findings from a study of light-truck characteristics and the light-truck market. Computer-simulation, crash-data, and crash-test studies examined the performance of widely used highway safety features when impacted by vehicles in the light-truck subclasses and found the features satisfactory for most impacts.

2002; 95 pp.; TRB affiliates, $12.75; nonaffiliates, $17. Subscriber category: safety and human performance (IVB).

A Procedure for Assessing and Planning Nighttime Highway Construction and Maintenance
NCHRP Report 475
A decision-making process is presented for highway agencies evaluating night work and alternative work times. The Report provides a comprehensive, quantitative basis for selecting the most cost-effective plan for ensuring the safety of public workers, maintaining capacity, minimizing community impact, and completing the work on schedule.

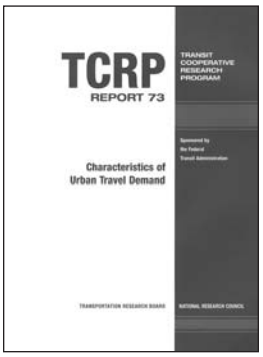
2002; 48 pp.; TRB affiliates, $11.25; nonaffiliates, $15. Subscriber category: maintenance (IIIC).

Recommended Practice for Evaluation of Metal-Tensioned Systems in Geotechnical Applications
NCHRP Report 477
This Report evaluates procedures for (*a*) estimating the design life of metal-tensioned systems in new geotechnical installations and (*b*) determining the condition and remaining service life of systems already in place. Included are recommendations for nondestructive testing and an appropriate prediction model to assess the condition and remaining service life of metal-tensioned systems.

2002; 117 pp.; TRB affiliates, $15.75; nonaffiliates, $21. Subscriber categories: soils, geology, and foundations (IIIA); materials and construction (IIIB).

Characteristics of Urban Travel Demand
TCRP Report 73
This comprehensive Report—which updates the 1978 and 1988 editions of U.S. DOT's *Characteristics of Urban Travel Demand*—is a companion to two other volumes: U.S. DOT's *Characteristics of Urban Transportation Systems* (updated in 1992) and *TCRP Web Document 12: Traveler Response to Transportation System Changes, Interim Handbook* (updated in 2000; available online). These three references constitute a multifaceted resource on urban transportation system characteristics. A CD-ROM (*CRP-CD-17*) contains supporting materials and is included with the Report.

2002; 57 pp. + CD-ROM; TRB affiliates, $21; nonaffiliates, $28. Subscriber categories: planning and administration (IA); public transit (VI).



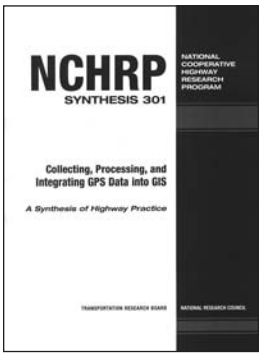
The Role of the Private-for-Hire Vehicle Industry in Public Transit
TCRP Report 75
This Report categorizes the public transit services provided by private-for-hire vehicles (PHVs). Part I documents results of a national survey of PHVs, which indicate a continuing trend toward diversification of operators and a heavy reliance on independent contractor drivers. Part II summarizes eight U.S. case studies and draws conclusions on funding, selection processes, public-private roles, and other characteristics. *CRP-CD-16*—a multimedia CD-ROM presentation on the case studies and on current services that PHVs provide for public transit—is included.

2002; 81 pp. + CD-ROM; TRB affiliates, $12.75; nonaffiliates, $17. Subscriber category: public transit (VI).

Managing Transit's Workforce in the New Millennium
TCRP Report 77
Transit industry workforce needs and the prospects for the coming decades are explored. The Report provides guidelines for employers assessing workforce needs; describes best practices for recruiting and retaining employees; and identifies ways to enhance or establish partnerships between management and labor for attracting, training, and maintaining a qualified workforce.

2002; 146 pp.; TRB affiliates, $15.75; nonaffiliates, $21. Subscriber category: public transit (VI).

Collecting, Processing, and Integrating GPS Data into GIS
NCHRP Synthesis 301
The integration of Global Positioning System (GPS) data with data from a geographic information system (GIS) can provide transportation departments and metropolitan planning organizations with a powerful set of planning and programming tools.



However, the process is not problem-free. This Synthesis focuses on the major issues associated with GPS and GIS data integration and identifies a six-step method that can help improve the quality of maps and reduce the severity of the problems associated with GPS–GIS integration.

2002; 65 pp.; TRB affiliates, $11.25; nonaffiliates, $15. Subscriber categories: planning and administration (IA); highway operations, capacity, and traffic control (IVA).

Mitigation of Ecological Impacts
NCHRP Synthesis 302
Since the early 1970s, transportation agencies have been responsible for identifying, designing, funding, and monitoring ecological mitigation activities as part of highway projects. Efforts to mitigate impacts on natural habitats have improved through research, innovation, and adaptation to regional concerns. This Synthesis documents the current practices of transportation agencies implementing ecological mitigation measures for aquatic, wetland, and riparian habitats. Issues summarized include the types of ecological impacts from highway projects and the methods of assessment; procedures used for determining the need for mitigation and monitoring and how sites are monitored; how mitigation is evaluated to determine success or failure, and the costs of mitigation.

2002; 100 pp.; TRB affiliates, $12.75; nonaffiliates, $17. Subscriber categories: planning, administration, and the environment (I); bridges, other structures, hydraulics, and hydrology (IIC); soils, geology, and foundations (IIIA).

Effective Use of Transit Websites
TCRP Synthesis 43
Almost every large and midsize public transportation agency has a website to provide information on fares, scheduling, routes, service disruptions, and special services, as well as employment postings, procurement information, and planning studies—extending transit marketing and communications programs. This report documents the experiences of transit agencies with website development and synthesizes current practices for website content, design, marketing, and administration. Costs, promotion, accessibility, and new directions—including trip planning, real-time information, and wireless capabilities—are discussed.

2002; 79 pp.; TRB affiliates, $12; nonaffiliates, $16. Subscriber category: public transit (VI).

Training for On-Board Bus Electronics
TCRP Synthesis 44
New applications of automotive electronics are changing the way transit agencies operate buses and how passengers use buses. This Synthesis documents procedures and resources used by transit agencies in training employees for advanced onboard electrical and electronic systems and equipment. The report focuses on the senior managers responsible for procuring, implementing, operating, and, in particular, maintaining onboard electronic equipment.

2002; 63 pp.; TRB affiliates, $11.25; nonaffiliates, $15. Subscriber category: public transit (VI).

Construction 2001
Transportation Research Record 1761
This Record addresses materials and construction in four topic areas: pavements, management of quality assurance, bridges and structures, and construction management. Specific case studies are highlighted: New Jersey's Superpave® specification, Washington State Department of Transportation's Superpave implementation, and the Paris–Lexington Road project. Other topics discussed include the theory behind vibration-based, onboard asphalt density measuring system; nighttime construction issues; and statistically based methods for verification testing.

2001; 158 pp.; TRB affiliates, $36; nonaffiliates, $48. Subscriber category: materials and construction (IIIB).

Transit Rail, Commuter Rail, Major Activity Center Circulation Systems, Light Rail, and Ferry Service
Transportation Research Record 1762
Papers present an array of research on public transit. Pedestrian warning and control devices, interurban electric railways, current applications and issues for presignals, rail station governance and parking practices, and several case studies—including an automated people mover in Indonesia—are examined.

2001; 56 pp.; TRB affiliates, $21.75; nonaffiliates, $29. Subscriber category: public transit (VI).

Multimodal and Marine Freight Transportation Issues
Transportation Research Record 1763
Results are reported for research into the environmental and economic effects of e-commerce,

regional intermodal freight transport flows and projections, freight planning models, a risk assessment for national transportation of selected hazardous materials, and security considerations for the ParcelCall real-time tracking and tracing system.

2001; 144 pp.; TRB affiliates, $31.50; nonaffiliates, $42. Subscriber categories: freight transportation (VIII); marine transportation (IX).

Assessing and Evaluating Pavements
Transportation Research Record 1764
This volume contains papers on the effects of measured tire contact stresses on near-surface rutting, rut-depth measurements, seasonal temperature effects on flexible pavements, and a virtual environment for a transportation data management system. Also addressed are basic analysis measurement data from Japan and advantages and limits of different road roughness profile signal-processing procedures applied in Europe.

2001; 259 pp.; TRB affiliates, $54; nonaffiliates, $72. Subscriber category: pavement design, management, and performance.

High-Occupancy Vehicle Systems and Demand Management 2001
Transportation Research Record 1765
A debate on proximate commuting, a modeling response to parking policy, a method for assessing high-occupancy toll-lane usage and network performance, and an estimation of effects of Washington State's trip-reduction program on traffic volumes and delays are among the topics presented.

2001; 42 pp.; TRB affiliates, $18.75; nonaffiliates, $25. Subscriber category: highway operations, capacity, and traffic control (IVA).

Asphalt Binders 2001
Transportation Research Record 1766
Papers focusing on asphalt binders review techniques for determining errors in asphalt binder rheological data, correlations between Superpave asphalt stiffness and in-service pavement performance, low-temperature binder specification development, and a sample preparation for direct tension testing.

2001; 66 pp.; TRB affiliates, $23.25; nonaffiliates, $31. Subscriber category: materials and construction (IIIB).

Asphalt Mixtures 2001
Transportation Research Record 1767
This Record addresses characteristics of cold-pressed asphalt millings and cement-emulsion mix, hydraulic conductivity of laboratory-compacted asphalt mixtures, constitutive relations for asphalt concrete under high rates of loading, gradation effects on hot-mix asphalt performance, and more.

2001; 172 pp.; TRB affiliates, $37.50; nonaffiliates, $50. Subscriber category: materials and construction (IIIB).

Transportation Data and Information Technology
Transportation Research Record 1768
Research results are presented on topics including conversion of weight of freight to number of rail cars, transferability of transportation planning data, temporal and spatial variations of real-time traffic data in urban areas, and the use of the Global Positioning System to improve school bus routing and scheduling. Case studies examine freight flow databases in South Africa and traffic characteristics in the Arab Gulf region.

2001; 267 pp.; TRB affiliates, $54; nonaffiliates, $72. Subscriber category: planning and administration (IA).

Pavement Management, Monitoring, and Accelerated Testing
Transportation Research Record 1769
Topics relate to pavement performance analysis with probabilistic deterioration methods, development of a preventive maintenance strategy for minimizing roughness-related pavement damage, data collection and management of instrumented smartroad flexible pavement sections, and fatigue performance of piezoelectric weigh-in-motion sensors.

2001; 151 pp.; TRB affiliates, $36; nonaffiliates, $48. Subscriber category: pavement design, management, and performance (IIB).

Design of Structures 2001
Transportation Research Record 1770
Examined are issues, procedures, and findings on escape adits for tunnel safety, debris flow simulation for highway cross culverts, dynamic loading of bridges, public participation and bridge type selection, repair and strengthening of concrete structures through application of corrective posttensioning forces with shape and memory alloys, and more.

2001; 242 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: bridges, other structures, and hydraulics and hydrology (IIC).

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NEWS BRIEFS are short (100- to 750-word) items of interest and usually are not attributed to an author. They may be either text or photographic or a combination of both. Line drawings, charts, or tables may be used where appropriate. Articles may be related to construction, administration, planning, design, operations, maintenance, research, legal matters, or applications of special interest. Articles involving brand names or names of manufacturers may be determined to be inappropriate; however, no endorsement by TRB is implied when such information is used. Foreign news articles should describe projects or methods that have universal instead of local application.

POINT OF VIEW is an occasional series of authored opinions on current transportation issues. Articles (1,000 to 2,000 words) may be submitted with appropriate, high-quality illustrations, and are subject to review and editing. Readers are also invited to submit comments on published points of view.

CALENDAR covers (*a*) TRB-sponsored conferences, workshops, and symposia, and (*b*) functions sponsored by other agencies of interest to readers. Because of the lead time required for publication and the 2-month interval between issues, notices of meetings should be submitted at least 4 to 6 months before the event. Due to space limitations, these notices will only appear once.

BOOKSHELF announces publications in the transportation field. Abstracts (100 to 200 words) should include title, author, publisher, address at which publication may be obtained, number of pages, and price. Publishers are invited to submit copies of new publications for announcement, and, on occasion, guest reviews or discussions will be invited.

LETTERS provide readers with the opportunity to comment on the information and views expressed in published articles, TRB activities, or transportation matters in gen-eral. All letters must be signed and contain constructive comments. Letters may be edited for style and space considerations.

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