

# APPENDICES

## **APPENDIX A. OVERVIEW OF MARKET STUDIES ON PASSENGER EXPERIENCE**

### **Previous Market Research: What do Passengers Expect from Transit?**

Our effort to gain an understanding of the value to passengers of different amenities began with collecting a variety of existing research pertaining to passengers' expectation of public transit. This research is drawn from market surveys, consumer focus groups, and observational studies. While each of these methods provides different insights, each has its limitations.

#### ***Market Research Surveys***

Market research surveys provide much useful information but are sometimes misleading in terms of understanding the role played by amenities. This is because amenities, by themselves, will *never* be more important to riders than the reliability, frequency, and safety of the service itself. As a result, market research conducted for the B-10 study seeks to take a different approach to understanding amenities and their impact on passengers.

A series of passenger surveys was collected from a variety of transit agencies across the country (see Appendix C). We were especially interested in surveys that evaluated what customers wanted, in order of priority, as opposed to ratings about existing local service. In general, efficient, on-time service and safety (in terms of absence of crime) appeared in different ways on different surveys as the highest priority among transit passengers:

1. A 1994 study of riders in Boston rated staying on schedule, frequency of service, and personal safety (from crime) as the most important attributes of transit service. While riders rated "adequate space" as a high priority (just after those mentioned above), fewer than 10% of riders cited temperature of vehicles, availability of information at stations, and lighting at stations as among the three most important attributes.
2. A survey of commuter bus alternatives in Northern Virginia found that half of respondents would pay more for service that was always on time and included express service. Few were willing to pay more for a highback seat, restrooms, newspapers, and luggage racks.
3. A survey of New York suburban rail commuters showed that their highest priorities were fewer stops, fewer delays, and faster trains; low priorities included more benches and seats to wait for trains, more comfortable temperatures on the train, and shelters on the platform.

4. A Chicago study of important factors in using the bus rated safe/competent bus operation, safety from crime while riding the bus, and safety from crime at stops as most important. Lower priority was availability of shelters at stops, and the lowest was availability of seats at stops.
5. In Portland, Oregon, riders said that safe operation of the bus or light rail train, personal safety when riding, and on-time service were the most important factors in deciding whether or not to use transit. A shelter for passengers to wait was a lower priority, although more important than a guaranteed seat on the bus or train.
6. In Denver, the most important areas for bus service improvements were convenience, travel time, and security; least important were customer information, comfort, and park-and-ride lots.

While the conclusion that might be drawn from this research is that amenities are relatively unimportant, other research methods and closer analysis reveal a different side to the story. It would appear from these surveys that, once the needs for safety, reliability and frequency were taken into account, amenities, such as transit shelters, padded seats and added lighting, rose to the top of the list. One could argue that, were a transit agency to improve efficiency and safety, passengers would begin to demand more in the way of amenities, both on the vehicles and at the transit stops. For example, in New York City, the Transit Authority was successful in eliminating graffiti from subway trains; however, passenger attention then shifted to concern over station environments.

### ***"Disutility Analysis"***

Another way that passenger experience has been assessed is in terms of the "disutility of travel"--an approach which is more of a theory or econometric model than a technique based on market research. Developed in a series of studies by the General Motors Research Laboratories (GMRL), the theory of disutility analysis states that the decision to use transit versus an auto depends on the "disutility" of each of its components, properly weighted. Some of the transit-related factors that are "penalized" are unproductive waiting, queue time, traveling while standing, unprotected transfers between vehicles, etc. While one might argue with some of the weights and penalties, this approach is a useful tool for transit agencies to use when considering how to better address passenger needs.

These penalties address several specific aspects of the travel experience, including travel, transfer, and waiting time (see Table 1). The authors write: "Time while waiting, either initially or during a transfer, is perceived by travelers to be worse than while riding. Many planners have adopted a rule-of-thumb that says that the value of time while waiting is twice the value of time while riding." This rule-of-thumb has been reconfirmed so often that it is now accepted without much question. A modal operator can achieve the same improvement in the disutility of a trip by eliminating two minutes of riding or by eliminating one minute of waiting. Waiting can be reduced by better schedule coordination, better passenger information, better on-time performance and by eliminating transfers whenever possible.

"It is most often assumed in transportation analyses that waiting time is wasted time. This may be true for short waits. But, given a sufficiently large block of time and the necessary resources, some passengers can use waiting time productively. The ability to work, eat, socialize, learn and attend to personal needs can contribute to a positive perception of waiting time."<sup>1</sup> The Music Under New York program operated by the MTA's Arts for Transit program provides musical entertainment for waiting passengers at subway stations throughout the system, which serves to lessen perceived waiting time and enhances the subway environment for all users. Many subway art programs developed worldwide are designed to accomplish this goal as well: stations in Boston, Baltimore, and Los Angeles, for example, provide many artistic distractions for waiting passengers.

**Table 1. SUGGESTED WEIGHTS, PENALTIES, TIME VALUES**

<b>Time Component</b>	<b>Weight</b>
Riding	1.00
Walking	1.25
Walking with Baggage	3.00
Unproductive Waiting	2.00
Productive Waiting	1.00
Queue Time	3.00
Traveling while Seated	1.00
Traveling while Standing	3.00
<b>Weather Condition</b>	<b>Weight Adjustment</b>
Rain	(+) 1.25
Below Freezing	(+) 4.25
<b>Action</b>	<b>Penalty</b>
Unprotected Vehicle to Vehicle	32 minutes
Protected Vehicle to Vehicle	16 minutes
Unprotected Time Vehicle to Vehicle	8 minutes
Protected Time Vehicle to Vehicle	4 minutes
Walk to Vehicle	8 minutes
Vehicle to Walk	0 minutes
<b>Trip Purpose</b>	<b>Time Values</b>
Travel to/from work	0.333 of wage rate
Work Related Travel	2.000 of wage rate
Non-work Travel	0.167 of wage rate

*Source: As presented in A. Horowitz and N. Thomas, "Evaluation of Intermodal Passenger Transfer Facilities," 1994.*

### ***Consumer Focus Groups***

In recent years, several transit agencies, in an effort to be more "customer-friendly", have undertaken extensive focus group programs to involve passengers in decisions regarding the design and selection of amenities for vehicles and waiting environments. These efforts are useful, as they emphasize real concerns of passengers in terms of design characteristics that impact the convenience, efficiency, and comfort of their journey.

A set of studies by the Canadian Urban Transit Association (CUTA) on interior bus design is particularly useful. *Customer Perspectives on Interior Bus Design Issues: An Analysis Based on Focus Groups*, and *Industry Perspectives on Interior Bus Design Issues: Background Research on Current Practice and Issues*, provide information about customers' views of amenities such as seating, climate control, handholds, route signage, and route maps on buses, electronic stop requests, exiting patterns, etc.

Focus groups were asked (as confirmed in a follow-up mini-survey) about the design feature they most wanted changed.<sup>2</sup> These were, in order of priority:

- Boarding, including climbing stairs into the buses, paying the fare, and handling children and parcels;
- Climate control, including less overheating in winter and a better balance between air conditioning and natural ventilation;
- Walking and standing on the bus, including hand holds, acceleration changes on the bus, and crowding of aisles;
- Sitting. For buses at five minute headways, the great majority of riders reported that they will wait for the next bus if no seat is available, if their trip is over 10 minutes in length.

Passengers made numerous additional recommendations, including:

- Easier access to buses (different steps, no steps, better hand rails);
- Easier control of the rear door;
- Padded or upholstered seats (to prevent slipping and sliding) with more leg room;
- Preference for stanchions or flexible straps, as opposed to overhead rails or handles on seat back, for standing;
- Improved ventilation (with less use of air conditioning when it was not needed);
- Better route maps and announcements of stops;
- Storage areas for baby strollers and parcels.

The authors of this study cautioned that "members of the riding public should always be considered the incontrovertible experts on their own perceptions. But when it comes to notions of what would represent a better state of affairs, the views expressed in a focus group research setting should not be taken in a literal sense. Suggestions which people make for the future *can* be taken to indicate their general approach or as a metaphor of their preference." One woman in Winnipeg provided a not uncommon scenario for why she felt

that boarding areas on buses needed to be improved: "I had a shopping bag on this arm; I had a purse and another shopping bag on this arm, and I held out my fare to the bus driver and he refused to take the money off of me... so I had to put my parcel down and in the meantime everyone is waiting for me..."<sup>3</sup>

Ironically, in a follow-up study, the transit agencies surveyed showed that they had *different* views of what passengers "wanted." In general, CUTA found that standard practice was to maximize the number of seats by compromising seat comfort and passenger movement; to provide air conditioning, but with small or restricted ventilation potential; to provide few on-board announcements; and to reduce visibility by eliminating rear windows.<sup>4</sup>

### ***Observational Studies of Transit Facilities***

Another research method, used by Project for Public Spaces for this study, is the actual observation of people at transit facilities, mainly in waiting environments. In the early 1980's, PPS evaluated bus shelters in over a dozen cities. On the basis of this research, several design requirements for shelters that met passenger needs were identified. These results are presented in Part 3.3; results of observational analyses are presented in case studies, where applicable.

## ENDNOTES

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<sup>1</sup> As described in A.J. Horowitz and N.A. Thompson, *Evaluation of Intermodal Passenger Transfer Facilities*, Sept. 1994, pp.19-21 (The study was conducted by the General Motors Research Lab.)

<sup>2</sup> CUTA, STRP Report #2, pp. 41-42

<sup>3</sup> CUTA, STRP Report #2, p. 17

<sup>4</sup> CUTA, STRP Report #7, p. I

**APPENDIX B. CASE STUDY SURVEY OF DATA**

**Bus Stop Comparisons**

	<b>Rochester</b>		<b>Portland</b>	
	Main	St. Paul/	NW23rd	Transit
	Street	Clinton	Avenue	Mall
<b>How many times a week do you use this stop?</b>				
Five or more times a week	56%	58%	50%	43%
3-4 times a week	14%	26%	21%	16%
Once or twice a week	16%	9%	12%	18%
Less than once a week	14%	7%	18%	22%
Rarely or never	0%	0%	0%	1%
<b>Where are you coming from?</b>				
From home	14%	23%	81%	41%
From work	38%	33%	9%	13%
From school	29%	26%	0%	3%
From shopping	13%	12%	5%	24%
Other	6%	6%	5%	20%
<b>Where are you going?</b>				
To home	78%	58%	10%	42%
To work	10%	21%	60%	13%
To school	3%	0%	18%	4%
To shopping	2%	7%	4%	11%
Other	7%	14%	8%	31%
<b>About how long do you usually wait for the bus at this stop?</b>				
Less than 5 minutes	2%	2%	23%	4%
5-10 minutes	40%	40%	59%	36%
11-20 minutes	38%	30%	12%	39%
21-30 minutes	10%	23%	1%	13%
More than 30 minutes	5%	0%	0%	4%
Don't know	6%	5%	5%	4%
<b>Have you changed how often you ride the bus over the past year?</b>				
Ride more frequently	34%	26%	37%	57%
Ride less frequently	10%	14%	7%	15%
Ride about the same amount	56%	60%	56%	28%
<b>Did you have a car available for this trip today?</b>				
Yes	15%	5%	51%	22%
No	85%	95%	49%	78%
<b>Please rate this bus stop for the following:</b>				
<b>Overall attractiveness</b>				
Good	34%	31%	52%	40%
Fair	49%	52%	47%	54%
Poor	15%	12%	0%	4%
Don't know	2%	5%	1%	2%
<b>Overall comfort</b>				
Good	30%	21%	43%	41%
Fair	47%	50%	49%	34%
Poor	23%	26%	8%	24%
Don't know	0%	2%	0%	2%

**Bus Stop Comparisons continued.**

	<b>Rochester</b>		<b>Portland</b>	
	<b>Main</b>	<b>St. Paul/</b>	<b>NW23rd</b>	<b>Transit</b>
	<b>Street</b>	<b>Clinton</b>	<b>Avenue</b>	<b>Mall</b>
<b>Ability to get schedule and routing information</b>				
Good	59%	49%	36%	71%
Fair	20%	27%	26%	21%
Poor	21%	20%	36%	5%
Don't know	0%	5%	3%	3%
<b>Amount of space away from pedestrian traffic / width of sidewalks</b>				
Good	62%	26%	65%	77%
Fair	25%	45%	32%	19%
Poor	10%	21%	3%	1%
Don't know	3%	7%	0%	3%
<b>Cleanliness</b>				
Good	43%	14%	40%	35%
Fair	39%	41%	50%	44%
Poor	18%	36%	10%	16%
Don't know	0%	10%	0%	4%
<b>Amount of seating</b>				
Good	32%	16%	24%	23%
Fair	32%	50%	63%	25%
Poor	37%	29%	13%	49%
Don't know	0%	5%	0%	3%
<b>Comfort of seating</b>				
Good	29%	26%	24%	30%
Fair	49%	37%	61%	33%
Poor	20%	26%	15%	31%
Don't know	2%	11%	0%	6%
<b>Protection from weather</b>				
Good	42%	17%	58%	50%
Fair	27%	39%	43%	37%
Poor	32%	39%	0%	10%
Don't know	0%	5%	0%	3%
<b>Adequacy of lighting</b>				
Good	49%	21%	41%	43%
Fair	32%	48%	38%	34%
Poor	14%	14%	7%	12%
Don't know	5%	17%	13%	12%
<b>Safety during the day</b>				
Good	69%	48%	55%	56%
Fair	25%	43%	35%	37%
Poor	3%	7%	10%	3%
Don't know	3%	2%	0%	4%
<b>Safety in the evening</b>				
Good	37%	12%	31%	30%
Fair	27%	43%	49%	45%
Poor	14%	29%	20%	15%
Don't know	22%	17%	0%	10%

**Bus Stop Comparisons continued.**

	<b>Rochester</b>		<b>Portland</b>	
	Main	St. Paul/	NW23rd	Transit
	Street	Clinton	Avenue	Mall
<b>Ease in walking to the stop</b>				
Good	69%	48%	59%	65%
Fair	26%	33%	41%	29%
Poor	3%	10%	0%	3%
Don't know	2%	10%	0%	3%
<b>Ease in boarding the bus</b>				
Good	67%	50%	72%	57%
Fair	28%	41%	25%	32%
Poor	3%	5%	1%	4%
Don't know	2%	5%	1%	6%
<b>The design of bus stops on this street makes me more likely to use transit.</b>				
Agree	40%	26%	38%	46%
Neutral	30%	43%	41%	27%
Disagree	23%	19%	13%	13%
No opinion	7%	12%	7%	14%
<b>The design makes me more likely to recommend riding transit to a friend.</b>				
Agree	41%	31%	38%	40%
Neutral	28%	45%	47%	40%
Disagree	22%	14%	10%	11%
No opinion	9%	10%	4%	10%

## Vehicle Comparisons

	San Francisco		Ann Arbor		Aspen	
	F Line +	Bus	LF *	RTS**	New #	Old
<b>How many times a week do you use this stop?</b>						
Five or more times a week	50%	58%	59%	51%	52%	56%
3-4 times a week	18%	24%	15%	19%	20%	23%
Once or twice a week	15%	5%	17%	17%	16%	7%
Less than once a week	18%	13%	9%	14%	8%	7%
Rarely or never	0%	0%	0%	0%	5%	7%
<b>Where are you coming from?</b>						
From home	35%	66%	40%	35%	60%	46%
From work	25%	13%	14%	18%	34%	47%
From school	10%	11%	23%	18%	3%	0%
From shopping	10%	3%	12%	18%	0%	4%
Other	20%	8%	11%	10%	3%	3%
<b>Where are you going?</b>						
To home	30%	16%	40%	51%	40%	58%
To work	20%	43%	11%	19%	40%	34%
To school	8%	3%	20%	9%	1%	1%
To shopping	20%	19%	15%	14%	3%	3%
Other	23%	19%	14%	8%	15%	4%
<b>Have you changed how often you use transit?</b>						
Ride more frequently	38%	34%	38%	36%	47%	41%
Ride less frequently	23%	17%	14%	19%	9%	11%
Ride about the same	40%	46%	48%	46%	44%	49%
<b>Did you have a car available for this trip today?</b>						
Yes	28%	27%	15%	16%	60%	56%
No	72%	73%	85%	84%	40%	44%
<b>Please rate this vehicle for the following:</b>						
<b>Overall attractiveness</b>						
Good	82%	18%	60%	46%	81%	46%
Fair	16%	68%	37%	51%	16%	49%
Poor	0%	15%	0%	4%	2%	5%
Don't know	3%	0%	3%	0%	0%	0%
<b>Overall comfort</b>						
Good	69%	18%	48%	47%	78%	32%
Fair	26%	74%	43%	51%	20%	48%
Poor	0%	9%	6%	1%	2%	19%
Don't know	5%	0%	3%	0%	0%	0%
<b>Ability to get schedule and routing information</b>						
Good	33%	17%	75%	40%	79%	86%
Fair	39%	36%	19%	50%	17%	11%
Poor	15%	44%	5%	10%	2%	3%
Don't know	13%	3%	2%	0%	2%	0%
<b>Cleanliness</b>						
Good	79%	14%	52%	41%	74%	59%
Fair	18%	60%	41%	51%	22%	40%
Poor	3%	26%	2%	6%	4%	0%
Don't know	0%	0%	6%	1%	0%	2%

Vehicle Comparisons continued.

	San Francisco		Ann Arbor		Aspen		
	F Line +	Bus	LF *	RTS**	New #	Old	
<b>Amount of seating</b>							
Good	64%	30%	57%	64%	72%	53%	
Fair	28%	64%	36%	35%	19%	36%	
Poor	8%	6%	5%	1%	9%	6%	
Don't know	0%	0%	3%	0%	0%	5%	
<b>Comfort of seating</b>							
Good	63%	17%	42%	55%	74%	19%	
Fair	32%	60%	45%	44%	21%	47%	
Poor	5%	23%	11%	1%	4%	34%	
Don't know	0%	0%	2%	0%	1%	0%	
<b>Adequacy of lighting</b>							
Good	76%	34%	68%	62%	70%	42%	
Fair	18%	60%	27%	35%	26%	37%	
Poor	3%	6%	0%	1%	4%	21%	
Don't know	3%	0%	5%	3%	1%	0%	
<b>Ease in getting on and off the vehicle</b>							
Good	73%	37%	83%	58%	83%	75%	
Fair	24%	51%	15%	41%	16%	25%	
Poor	3%	11%	0%	1%	1%	0%	
Don't know	0%	0%	2%	0%	0%	0%	
<b>Ease in walking through the vehicle</b>							
Good	76%	30%	66%	54%	78%	68%	
Fair	18%	49%	30%	44%	21%	27%	
Poor	10%	21%	2%	1%	1%	3%	
Don't know	3%	0%	3%	0%	0%	2%	
<b>Safety during the day</b>							
Good	77%	37%	75%	65%	86%	78%	
Fair	18%	43%	16%	34%	13%	17%	
Poor	3%	11%	3%	0%	1%	5%	
Don't know	3%	9%	6%	1%	0%	0%	
<b>Safety in the evening</b>							
Good	54%	26%	57%	54%	81%	70%	
Fair	22%	40%	27%	36%	13%	22%	
Poor	5%	14%	3%	0%	2%	3%	
Don't know	19%	17%	13%	11%	4%	5%	
<b>Smoothness/quietness of ride</b>							
Good	53%	21%	26%	42%	59%	30%	
Fair	42%	35%	55%	50%	37%	60%	
Poor	5%	44%	11%	8%	5%	8%	
Don't know	0%	0%	8%	0%	0%	2%	
<i>Please respond to the following statements:</i>							
<b>The design features on this vehicle make me more likely to use transit</b>							
Agree	74%	14%	39%	36%	52%	10%	
Neutral	23%	46%	37%	46%	35%	61%	
Disagree	0%	19%	4%	6%	5%	8%	
No opinion	3%	22%	20%	12%	9%	21%	

Vehicle Comparisons continued.

	San Francisco		Ann Arbor		Aspen		
	F Line +	Bus	LF *	RTS**	New #	Old	
The design features on this vehicle make me more likely to use transit							
Agree	74%	14%	39%	36%	52%	10%	
Neutral	23%	46%	37%	46%	35%	61%	
Disagree	0%	19%	4%	6%	5%	8%	
No opinion	3%	22%	20%	12%	9%	21%	
The features make me more likely to recommend riding transit to a friend							
Agree	66%	14%	39%	46%	54%	11%	
Neutral	29%	37%	32%	33%	31%	54%	
Disagree	0%	26%	8%	8%	6%	13%	
No opinion	5%	23%	22%	14%	9%	23%	
The transit agency seems concerned about the needs of its customers							
Agree	35%	19%	54%	57%	67%	52%	
Neutral	41%	22%	32%	30%	20%	20%	
Disagree	11%	43%	2%	7%	7%	13%	
No opinion	14%	16%	14%	7%	6%	15%	
<b>(+) Historic PCC Streetcars</b>							
<b>(*) Low Floor Buses</b>							
<b>(**) Conventional Bus w/ Steps and Lifts</b>							
<b>(#) New Neoplan Buses</b>							

## APPENDIX C. BIBLIOGRAPY

### General Information

American Public Transit Association. *1995 Transit Vehicle Fleet Inventory*. Washington, D.C. (1995).

American Public Transit Association. *1996 Transit Fact Book*. Washington, D.C. (1996).

Bernheim, Mark. "Umbrellas in Three-Quarter Time." *Austrian Information*. 48(3) (1995).

Bragg, Rick. "Buses Again Trouble Civil Rights Veterans: In Montgomery and Elsewhere, the Money to Run Them Is Drying Up." *New York Times*. (16 June 1996).

Federal Transit Administration. *Advanced Public Transportation Systems: The State of the Art*, (1996).

Federal Transit Administration Liveable Communities Initiative. *Planning, Developing, and Implementing Community Sensitive Transit*. (1996)

Florida Center for Community Design and Research. *Impact of Community Design on Transportation*. Center for Urban Transportation Research. (1993).

International Center of the Academy for State and Local Government. *Public Innovation Abroad*, (June 1996).

Knack, Ruth E. "In Defense of Buses." *Planning*. (Oct 1994) pp. 13-17.

Long Island Railroad/Buckhurst, Fish & Jaquemart, Inc. *Long Island Railroad Transportation Hub Integration Study*. Vols. 1-2. (1995).

Maryon, John. "Nantes Gets New Heuliez." *Urban Transport International*. No.4. March/April (1996).

Topp, Hartmut H. "Revitalizing Public Surface Transport in German Cities." Universitat Kaiserslautern, Germany.

"Transit Garners National Design for Transportation Awards." *Passenger Transport*. (11 March 1996) p.8.

TCRP B-1. *Evaluating Transit Operations for Individuals with Disabilities*. EG&G Dynatrend and Crain & Associates, Inc. (1996). [published as TCRP Web Document 2, Transportation Research Board, National Research Council, Washington, D.C.]

TCRP J-3. *International Studies Program: Developing Global Perspectives in Public Transportation Management*. (1996).

TCRP Report 8. "The Quality Journey: A TQM Roadmap for Public Transportation." Transportation Research Board, National Research Council, Washington, D.C. (1995).

TCRP Report 22. "The Role of Transit in Creating Livable Metropolitan Communities." Transportation Research Board, National Research Council, Washington, D.C. (1997).

TCRP Synthesis of Transit Practice 10. "Bus Route Evaluation Standards." Transportation Research Board, National Research Council, Washington, D.C. (1995).

Tri-Met. *Planning and Design for Transit Handbook* (1996).

US Department of Transportation. "Transportation for Individuals with Disabilities." *Federal Register* (1991).

Vuchic, Vukan R. *Cars, Transit, and Livable Cities*. Philadelphia: University of Pennsylvania (1996) (unpublished manuscript)

Woodhull, Joel "Link Between Transit and Land Use: The Pedestrian." *Transportation Planning*. No.4. (1995)

Zeithaml, Valarie A. A. Parasuraman, and Leonard L. Berry. *Delivering Quality Service: Balancing Customer Perceptions and Expectations*. New York: The Free Press (1990).

### **Historical Studies**

Dunbar, Charles S. *Buses, Trolleys, and Trams*. London: Hamlyn (1967).

Hancock, B.S., and E.J. Woodcock. "The History and Design of Double-Deck Buses and Coaches." *International Journal of Vehicle Design*. 9.1 (1988) pp. 107-21.

Kashin, S. and H. Denoro. *An American Original: The PCC Car*. Glendale, CA: Interurban Press. (1986).

Mandell, Susan M., Peter S. Andrew, and Bernard Ross. *A Historical Survey of Transit Buses in the United States*. Warrendale, PA: Society of Automotive Engineers, Inc. (1990).

### **Market Research/Passenger Surveys**

AC Transit. *On Board Survey Report*. Oakland, CA. (Sept. 1993).

Canadian Urban Transit Administration. *Customer Perspectives on Interior Bus Design*

*Issues: An Analysis Based on Focus Groups.* Strategic Transit Research Program Report #2. (1991).

-----. *Industry Perspectives on Interior Bus Design Issues: Background Research on Current Practice and Issues.* Strategic Transit Research Program Report #7. (1992).

Chittenden County Transportation Authority (CCTA) - Burlington, VT. Multisystems. (1995).

Connecticut Transit (CT Transit). *Market Research Recommendations: Hartford, New Haven, Stamford.* (1996).

Hensher, David A. "Hierarchical Stated Response Designs: An Application to Bus User Preferences." *Logistics and Transportation Review.* 26.4 (December 1990) p. 299.

King County Metro, Seattle. *Bus Designs for the Future.* (June 1994).

Massachusetts Bay Transportation Authority (MBTA) - Boston, MA. MacDorman & Associates. *Service Quality Report.* (1994).

METRA - Chicago, IL. Public Sector Research Group. *Comparison of 1985 and 1991 METRA Service Ratings.*

Metropolitan Transportation Authority (MTA) - New York, NY. Intersearch Corporation of New York. *1995 Citywide Tracking Survey.*

Metropolitan Transportation Authority (MTA) - New York, NY. Marketing Research Division. *Interim Report on the Suburban Consumer Decision Criteria Study: The Potential Impact of Future Capital and Operating Improvements on Consumer Preferences for Using MTA's Commuter Railroads.* (1990).

Metropolitan Transportation Authority and New York City Transit Authority/Phaedrus, Inc. *New Technology Subway Trains: Customer Research For Car Design Directions (Final Report).* (December 1990).

"Modal Split in the USA and OECD." *Urban Transport International.* March/April (1996).

New Jersey Transit/Phaedrus, Inc. *Customer Research: Interior Design Directions.* (1993).

New Jersey Transit/URS Consultants, Inc. *Rail Coach Preference Survey.* (1995).

New Jersey Transit. *Customer Satisfaction Survey.* (1995).

----- Total Research Corporation. *Rail Customer Satisfaction Technical Report*. (1995).

New York City Transit/Schulman, Ronca & Bucuvalas, Inc. *New Technology Test Trains Focus Group Study*. (June 1994).

Northern Virginia Transportation Commission/SG Associates. *Market Study of Commuter Bus Alternatives in Northern Virginia*. (1988).

Regional Transportation Authority (RTA) - Chicago, IL. Northwest Research Group. *Customer Satisfaction Survey*. (1995).

Regional Transportation District (RTD) - Denver, CO. The Howell Research Group. *1995 Customer Satisfaction Survey*. (1996).

SunTran - Arizona. Clark Jones, Inc. *University of Arizona Survey Report*. (1993).

Tri-Met - Portland, OR. The Gilmore Research Group. *Attitude and Awareness Study*. (1995).

----- Northwest Research Group. *Attitude and Awareness Survey*. (1994).

----- *Travel Mode Choice Survey Portland Metropolitan Area*.

## **Ridership**

Bleyer, B. "Double-Deckers Increase Ridership." *Mass Transit*. 17.3 (1990) p. 3.

Derdeyne, E. "Mapping Out Ridership Increases." *Mass Transit*. 17.3 (1990) pp.10-11.

Oram, Richard L. and Start, Steven, "Infrequent Riders: One Key to New Transit Ridership and Revenues," *Transportation Research Record 1521* (1996) pp. 37-41.

*TCRP Research Results Digest 6*. "Research Agenda for Increasing Transit Ridership." Transportation Research Board, National Research Council, Washington, D.C. (1995).

*TCRP Research Results Digest 4*. "Transit Ridership Initiative." Transportation Research Board, National Research Council, Washington, D.C. (1995).

## **Security**

Felson, Marcus et al. "Preventing Crime at Newark Subway Stations." *Security Journal*. 1.3 (1990) pp. 137-42.

Federal Transit Administration. *Transit Security Procedures Guide*. (1994).  
----- *Transit System Security Program Planning Guide*. (1994).

Federal Transit Administration/Southeastern Pennsylvania Transportation Authority. *National Conference on Transit Security: Report and Recommendations*. (1994).

*The Safe City: Municipal Strategies for Preventing Violence Against Women*. (1988).

Scarborough Women's Center/Toronto Transit Commission, Toronto, Canada. *Making Transit Stops Safer for Women: Scarborough Moves Forward*. (1991).

Southern California Rapid Transit District/Booz-Allen & Hamilton, Inc. *Security Policies Recommendations Study*. (1983).

Toronto Transit Commission/METRAC. *Moving Forward: Making Transit Safer for Women*. (1989).

### **Passenger Transport Articles**

(From *Passenger Transport*. American Public Transit Association. Washington, D.C.)

"Atlanta Installs Information Kiosks". (March 1994).

"Customer-Related Research Key at NYC Transit". (June 1995).

"Electricity Adds DASH to Phoenix Transit Fleet". (Jan. 1995).

"Maryland Officials Report Favorable Light Rail Ridership". (March 1994).

"MTA New York City Transit Benefits from Ongoing Revitalization Activities". (June 1995).

"MUNI's Outdoor Rail Stations Blend Function and Aesthetic". A. Milner (June 1995).

"New York Unveils 'New Technology Test Trains': Solicited Riders' Input for Design". (June 1993).

"New York's New Subway Cars Ready for Service". (July 1993).

"NJ Transit Reports Highest Ridership Total in Seven Years". (Dec. 1993).

"Orlando Makes Quick Changes Based on Market Research". R. Elmore-Yalch/L. Morsen. (May 1994).

"Phoenix Riders Can Pay with Credit Card". (May 1995).

"Riverside Reports Ridership Up 23%". (June 1993).

"San Francisco MUNI Upgrades Streetcars, Subways." (Sept. 1994).  
"Seattle Metro Encourages Bicyclists with Lockers, Banks." (Oct. 1995).

"Vintage Open-Air Touring Bus Enters Service in Houston." (Sept. 1995)

"Voice Annunciator System Is Tested on NJ Transit Buses." (May 1995).

## **Projects**

Cervero, Robert. *Creating a Linear City with a Surface Metro: The Story of Curitiba, Brazil*. Working Paper 643, National Transit Access Center/Institute of Urban and Regional Development, University of California at Berkeley. (June 1995).

Federal Transit Administration. *Case Study of the Denver Regional Transportation District ECO Pass Program*. (1993).

Howard, James M. "Transit Centers: What Works, What Doesn't." *Transit Connections*. (Sept 1994) pp.14-20.

MacFarquar, Neil. "Modernize a Subway? Not so Fast, Critics Say." *New York Times*, 2 (April 1996).

APTA, "San Francisco Bay Area Reports Ridesharing Up." *Passenger Transport*. (31 July 1995) p.12.

US Department of Transportation/Federal Transit Administration. *Art in Transit... Making it Happen*. (1996).

-----, *Transit Planning and Research Programs: Fiscal Year 1994 Project Directory*. (1995).

-----, *Transit Planning and Research Programs: Fiscal Year 1995 Project Directory*. (1996).

Vantuono, William C. "Commuter Railcars: Riders Help Write the Specs." *Railway Age*. (April 1996) pp. 61-64.

Warren, William D. "Why Success in St. Louis?" *TR News*. Transportation Research Board, National Research Council, Washington, D.C. (Sept-Oct 1995) pp. 22-26.

## **Technology - Buses**

"Buses Serve Cities World-Wide." *Passenger Transport International*. (Feb 1993) pp. 68-77.

Goldsack, Paul, and Susan C. Anastasi. "Seeking the Bus Design of Tomorrow." *Mass Transit*. (May 1988) pp.24-58.

Levine, Jonathan and Gwo-Wei Torng, *Dwell Time Effects of the Low Floor Bus Design*, University of Michigan. (1992).

Los Angeles County Metropolitan Transit Authority/Northrop Grumman. *Advanced Technology Transit Bus (ATTB)*. (1995).

Shepard, Lyn. "Low-Floor Bus Design." *Mass Transit*. (Sept-Oct 1993) pp. 101-4.

*TCRP Synthesis of Transit Practice 2*. "Low-Floor Transit Buses." Transportation Research Board, National Research Council. Washington, D.C. (1994).

Wolinsky, Julian. "Costing More, Taking Longer." *Bus World*. (Spring 1995) pp. 24-27.

### **Technology - Rail**

Guild, William K. "Village Light Rail: Not Just a Nostalgia Trip." *Making Tracks*. 1(3). (July 1995).

"Low-Floor LRV's Gain in Popularity." *International Railway Journal*. (January 1990) pp.43-48.

Marie, J. and Kluge, B. "The Legacy of the Low-Floor LRV." *Mass Transit*. (May-June 1995) pp. 28-32.

"People-Movers Around the World." *Mass Transit*. (May-June 1995) pp. 22-26. Spotts, Peter N. "Skyful of Satellites May Keep Trains on Right Track." *The Christian Science Monitor*. (2 April 1996), p.3.

*TCRP Report 2*. "Applicability of Low-Floor Light Rail Vehicles in North America." Transportation Research Board, National Research Council, Washington, D.C. (1995).

"UITP Congress Unveils Transit Innovations." *Mass Transit*. (May-June 1995) pp. 42-46.

### **Technology - General**

KRW Incorporated. *Guidelines for Transit Facility Signing and Graphics*. (1996).

Maryon, John. "Smart Cards - On the Way." *Urban Transport International*. No. 6 (July-August 1996).

Mathieu, Michel. "Seating, Seats at the RATP Through the Ages." *Urban Transport International*. (No. 5 May/June 1996).

Moreyne, M. "Integrated Communication, Information, and Security Systems (ICISS) for Visually and Hearing Impaired Persons: Results of Demonstration in the Montreal Metro System." Telecite Inc. (1992).

-----, A. Bourion, and T. Smith. "The Visual Communication Network: An Integrated Communication, Information, and Security System Inside Transit Vehicles." (1992).

Orski, Kenneth C. (ed.) "The Intelligent Transportation Infrastructure (ITT) Initiative." *Innovation Briefs*. 7(3). (June 1996).

-----, "Traveler Information Systems: The Future is Now." *Innovation Briefs*. 7(3). (June 1996).

"Setra Develops New Idea." *Urban Transport International*. No.4. (March/April 1996).

Stock, Georg. "Modern Seating in Mass Transit." *Urban Transport International*. (May/June 1996).

Tallon, Robert. "The Designer's View" *Urban Transport International*. No. 5. (May/June 1996).

TCRP A-1. *Fare Policies, Structures, and Technologies*. Multisystems. (1995). [published as *TCRP Report 10*. Transportation Research Board, National Research Council, Washington, D.C.]

TCRP A-4. King County Department of Metropolitan Services. *Electronic On-Vehicle Passenger Information Displays (Visual and Audible)*. (1995). [published as *TCRP Research Results Digest 5*. Transportation Research Board, National Research Council, Washington, D.C.]

TCRP A-9. *Signs and Symbols in Transit Facilities*. KRW Incorporated. (1995). [published as *TCRP Report 12*. Transportation Research Board, National Research Council, Washington, D.C.]

TCRP A-1. *Transit Fare Decision-Making Guidelines*. Multisystems. (1996). [published as *TCRP Research Results Digest 16*. Transportation Research Board, National Research Council, Washington, D.C. 1997]

US Department of Transportation/Federal Transit Administration. *Review and Assessment of En-Route Transit Information Systems*. (1995).

Wright, J.L. and F.O. Robinson. *Travlink -- Can Information Influence Choice?* ITS America 1993 Conference Proceedings pp. 89-93.

## **Waiting Environments**

Federal Highway Administration/Center for Urban Transportation Studies. *Evaluation of Intermodal Passenger Transfer Facilities*. (1994).

Hiss, Tony. *American Train Stations Are Seed Pearls of the 21st Century*. (unpublished)

London Transport. *Passenger Information at Bus Stops (PIBS): Report on Monitoring Studies of Route 18 Demonstration*. (1994)

Project for Public Spaces, Inc., *Designing Effective Pedestrian Improvements in Business Districts*. American Planning Association. Planning Advisory Service Report No. 368 (1982).

*TCRP Report 19*. "Guidelines for the Location and Design of Bus Stops." Transportation Research Board, National Research Council, Washington, D.C. (1996).

Tri-Met. *Bus Stop and Passenger Amenities Guidelines*. (1995).

US Department of Transportation/Federal Transit Administration. *Art in Transit...Making it Happen*. (Feb. 1996).

US Department of Transportation Intermodal Terminal Committee. *Intermodal Passenger Terminal Facilities: Project Summaries*. (1994).

Valley Metro. Regional Public Transportation Authority. *Off-Street Improvements for Transit: Passenger Facilities Handbook*. (1995).

----- . *Street Improvements for Transit: Bus Stop Handbook*. (1993).