



Synthesis of Information Related to Transit Problems: 2013

DETAILS

10 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-22375-1 | DOI 10.17226/22653

AUTHORS

Williams, Jon

BUY THIS BOOK

FIND RELATED TITLES

Visit the National Academies Press at NAP.edu and login or register to get:

- Access to free PDF downloads of thousands of scientific reports
- 10% off the price of print titles
- Email or social media notifications of new titles related to your interests
- Special offers and discounts



Distribution, posting, or copying of this PDF is strictly prohibited without written permission of the National Academies Press. (Request Permission) Unless otherwise indicated, all materials in this PDF are copyrighted by the National Academy of Sciences.

TRANSIT COOPERATIVE RESEARCH PROGRAM

Sponsored by the Federal Transit Administration

Responsible Senior Program Officer: Gwen Chisholm Smith

Research Results Digest 106

SYNTHESIS OF INFORMATION RELATED TO TRANSIT PROBLEMS

This is a staff digest of the progress and status of TCRP Project J-7, "Synthesis of Information Related to Transit Problems," for which the Transportation Research Board is the agency conducting the research. Individual studies for the project are managed by Donna L. Vlasak, Senior Program Officer, with assistance from Jon M. Williams, Program Director, Synthesis Studies, serving under the Studies and Special Programs Division of the Transportation Research Board, Stephen R. Godwin, Director.

BACKGROUND

The Transit Cooperative Research Program (TCRP) was established in 1992. The U.S. Department of Transportation proposed the TCRP, and it was authorized in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. The program was reauthorized in the Transportation Equity Act for the 21st Century (TEA-21), the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), and moving ahead for progress in the 21st Century (MAP-21). On May 13, 1992, a memorandum agreement outlining operating procedures was executed by three cooperating organizations: the Federal Transit Administration (FTA); the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a non-profit educational and research organization established by the American Public Transportation Association (APTA). The memorandum agreement was updated on January 12, 1999.

INTRODUCTION

Transit administrators, engineers, and researchers often face problems for which

You can submit your recommendation at: <http://www.trb.org/SynthesisPrograms/Suggest.aspx> under "Synthesis Topic Submittals." Topics suggested must be accompanied by a brief (one or two paragraphs) scope statement, including a discussion of the problem. A title (preferably 10 words or less) and the name and affiliation of the submitter are also necessary. Identification of information sources is appreciated. If a topic is not selected, it must be resubmitted the following year to be considered. Annually, synthesis topics are typically due by March 15, 2013. The TCRP Oversight Panel for the project meets in May/June to select new topics based on funding available.

Interested in writing a synthesis? For details contact Donna L. Vlasak by e-mail at dvlasak@nas.edu or by phone at 202/334-2974 or Jon M. Williams at jwilliams@nas.edu or by phone at 202/334-3245.

information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, “Synthesis of Information Related to Transit Problems,” searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, Synthesis of Transit Practice.

THE SYNTHESIS PROGRAM

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the current knowledge available on those measures found to be the most successful in resolving specific problems. To develop these syntheses in a comprehensive manner and to ensure inclusion of significant knowledge, TRB employs a consultant to gather and analyze available information from numerous sources, including a large number of transit agencies. A panel of experts in the subject area is established to guide the consultants in organizing and evaluating data collected on each topic and to review the synthesis report.

For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practice has been used for solving or alleviating problems; (3) to identify all ongoing research; (4) to learn what problems remain largely unsolved; and (5) to organize, evaluate, and document the useful information that is acquired.

Each synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As the processes of advancement continue, new knowledge can be expected to be added to that which is now on hand; eventually the synthesis may need to be updated or redone. If you believe that a synthesis should be updated, it would be appreciated if you would contact TRB and let us know.

Selection of Topics

TCRP Oversight Panel J-7 meets each year (typically in May) to select topics for study using funds from the upcoming fiscal year. The membership of this committee is given in Table 1. Current funding allows for initiation of approximately six syntheses per year.

The following factors are considered in the selection process for synthesis topics:

- The problem should be widespread enough to generate broad interest in the synthesis.
- The topic should be timely and critical with respect to economic impact, safety, or social impact.
- The topic is appropriate if current practice is nonuniform or inconsistent from agency to agency, or if the validity of some practices appears to be questionable.
- The quality and quantity of useful available information should indicate a need to organize and compress that which has already been learned and written on the topic.
- The topic should not be one where ongoing research or other activities in progress might be expected to render the synthesis obsolete shortly after completion.

The continued success of this project depends on a constant supply of worthy synthesis topics solicited annually from a variety of sources, including transit officials, equipment and service suppliers, research organizations, FTA, APTA, and TRB committees. The interest of those who have recommended topics is sincerely appreciated, and they are urged to continue.

Conduct of the Studies

Throughout the year, following the J-7 Oversight Panel’s selection of topics, studies are initiated in the order of priority assigned by the com-

Table 1 TCRP Project Panel J-7

	Name	Affiliation
Chair	Dwight A. Ferrell	Metropolitan Atlanta Rapid Transit Authority, Atlanta, GA
Member	Debra W. Alexander	Capital Area Transportation Authority, Lansing, MI
Member	Donna DeMartino	San Joaquin Regional Transit District, Stockton, CA
Member	Mark W. Fuhrmann	Metro Transit, Minneapolis/St. Paul, MN
Member	Robert H. Irwin	BC Transit, Sooke, AB, Canada
Member	Jeanne Krieg	Eastern Contra Costa Transit Authority, Antioch, CA
Member	Paul J. Larrousse	Rutgers, The State University of New Jersey, New Brunswick, NJ
Member	David A. Lee	Connecticut Transit, Hartford, CT
Member	Frank T. Martin	Atkins, Orlando, FL
Member	Bradford J. Miller	Pinellas Suncoast Transit Authority (PSTA), St. Petersburg, FL
Member	Hayward M. Seymore, III	Kitsap Transit, Bremerton, WA
Member	Frank Tobey	First Transit, Inc., Moscow, TN
Liaison	Jarrett W. Stoltzfus	Federal Transit Administration, Washington, D.C.
Liaison	Kevin Dow	American Public Transportation Association, Washington, D.C.
Liaison	Jennifer A. Rosales	Transportation Research Board, Washington, D.C.

mittee. A panel consisting of practitioners and researchers is formed for each topic. At its first meeting, this topic panel thoroughly discusses the topic, refines the tentative scope, suggests sources of information, and selects the consultant based on expression of interest received in response to an industry-wide solicitation.

Following this meeting, an agreement is negotiated with the consultant to gather information on the topic, synthesize it, and draft a report. Typically, the agreement covers a period of 9 months. Information gathering and preparation of the first draft of the synthesis report usually takes 5 months. This draft is then reviewed by the topic panel with the consultant, often at a second panel meeting. Subsequent drafts and a meeting are scheduled if needed, although this rarely occurs.

After the staff is substantially satisfied with the report, a final draft is sent to the members of the TCRP Oversight Panel J-7 for their approval. At the same time, members from the topic panel have their last chance to review the report. Comments from these reviews are incorporated into the final report, which is usually published as a TCRP Synthesis of Transit Practice.

Studies in Progress as of January 2013

Work is currently under way on the topics listed in Table 2. Questions on these topics should be addressed to the Project Study Manager, Donna

L. Vlasak (e-mail: dvlasak@nas.edu and 202/334-2974) or the Synthesis Studies Manager, Jon M. Williams (e-mail: jwilliams@nas.edu and 202/334-3245).

Table 2 Synthesis Studies—In Progress as of January 2013

No.	Title
SA-28	Use of Electronic On-Street Signage in Transit
SA-29	Energy Savings Strategies for Transit Agencies
SA-30	Maintaining Transit Effectiveness under Major Financial Constraints
SA-31	Common Sense Approaches for Improving Transit Bus Speeds
SA-32	System-Specific Spare Bus Ratios Update
SB-21	Transit Station and Stop Adoption Programs
SB-22	Use of Customer Research Market Panels in Transit
SB-23	Integrating Passenger Ferry Service with Mass Transit
SB-24	Advanced Methods for Title VI Fare and Service Equity Analysis
SD-04	Rail Transit Track Inspection Practices
SF-17	Transit Operator Distraction Policies
SG-12	Optimizing Bus Warranty
SH-14	Sub-Allocating FTA Section 5307 Funding Among Multiple Recipients in Metropolitan Areas

Available Publications

The Syntheses of Transit Practice that have been completed under this project are listed in Table 3. Copies of these syntheses can be obtained from the Publications Office, Transportation Research Board, 500 Fifth Street, N.W., Washington, D.C., 20001; by calling 202/334-3213; and through the Internet at:

<http://books.trbbookstore.org>. Please send check orders to: TRB, PO Box 741494, Atlanta, GA 30374-1494, or fax to: 202/334-2519.

Index of Topic Studies

Table 4 is a key word index of published syntheses and studies currently in progress.

Table 3 Published TCRP Syntheses

No.	Title/Pages/Price
1	Safe Operating Procedures for Alternative Fuel Buses (1993) 48 pp., \$16.00
2	Low-Floor Transit Buses (1994) 43 pp., \$12.00
3	Incentive Programs to Improve Transit Employee Performance (1994) 44 pp., \$12.00
4	Integration of Bicycles and Transit (1994) 58 pp., \$12.00
5	Management Information Systems (1994) 77 pp., \$19.00
6	The Role of Performance-Based Measures in Allocating Funding for Transit Operations (1994) 52 pp., \$11.00
7	Regulatory Impacts on Design and Retrofit of Bus Maintenance Facilities (1994) 50 pp., \$12.00
8	Retrofit of Buses to Meet Clean Air Regulations (1994) 48 pp., \$12.00
9	Waste Control Practices at Bus Maintenance Facilities (1995) 26 pp., \$10.00
10	Bus Route Evaluation Standards (1995) 54 pp., \$12.00
11	System-Specific Spare Bus Ratios (1995) 46 pp., \$12.00
12	Transit Bus Service Line and Cleaning Functions (1995) 48 pp., \$14.00
13	Risk Management for Small and Medium Transit Agencies (1995) 31 pp., \$13.00
14	Innovative Suburb-to-Suburb Transit Practices (1995) 50 pp., \$14.00
15	System-Specific Spare Rail Vehicle Ratios (1995) 43 pp., \$13.00
16	Changing Roles and Practices of Bus Field Supervisors (1996) 45 pp., \$13.00
17	Customer Information at Bus Stops (1996) 64 pp., \$18.00
18	Bus Occupant Safety (1996) 55 pp., \$15.00
19	Passenger Transfer System Review (1996) 37 pp., \$14.00
20	Transit-Focused Development (1997) 55 pp., \$16.00
21	Improving Transit Security (1997) 36 pp., \$15.00
22	Monitoring Bus Maintenance Performance (1997) 48 pp., \$16.00
23	Inspection Policy and Procedures for Rail Transit Tunnels and Underground Structures (1997) 95 pp., \$25.00
24	AVL Systems for Bus Transit (1997) 47 pp., \$16.00
25	Light Rail Vehicle Compression Requirements (1997) 34 pp., \$15.00
26	Bus Transit Fare Collection Practices (1997) 29 pp., \$14.00
27	Emergency Preparedness for Transit Terrorism (1997) 73 pp., \$21.00
28	Managing Transit Construction Contract Claims (1998) 50 pp., \$17.00
29	Passenger Counting Technologies and Procedures (1998) 50 pp., \$23.00
30	ADA Paratransit Eligibility Certification Practices (1998) 38 pp., \$16.00
31	Paratransit Contracting and Service Delivery Methods (1998) 35 pp., \$16.00
32	Transit Advertising Revenue: Traditional and New Sources and Structures (1998) 58 pp., \$20.00
33	Practices in Assuring Employee Availability (1999) 69 pp., \$27.00
34	Data Analysis for Bus Planning and Monitoring (2000) 62 pp., \$27.00
35	Information Technology Update for Transit (2000) 98 pp., \$31.00
36	Identifying and Reducing Fraudulent Third Party Tort Claims Against Public Transit Agencies (2000) 58 pp., \$25.00
37	Communicating with Persons with Disabilities in a Multimodal Environment (2001) 48 pp., \$26.00
38	Electronic Surveillance Technology on Transit Vehicles (2001) 57 pp., \$28.00
39	Transportation on College and University Campuses (2001) 62 pp., \$28.00
40	A Challenged Employment System: Hiring, Training, Performance Evaluation, and Retention of Bus Operators (2001) 72 pp., \$29.00

Table 3 (Continued)

No.	Title/Pages/Price
41	The Use of Small Buses in Transit Service (2002) 72 pp., \$15.00
42	Use of Flexible Funds for Transit Under ISTEA and TEA-21 (2002) 40 pp., \$15.00
43	Effective Use of Transit Websites (2002) 79 pp., \$16.00
44	Training for On-Board Bus Electronic (2002) 63 pp., \$15.00
45	Customer-Focused Transit (2002) 100 pp., \$17.00
46	Diversity Training Initiatives (2003) 59 pp., \$15.00
47	Corporate Culture as the Driver of Transit Leadership Practices (2003) 91 pp., \$17.00
48	Real-Time Bus Arrival Information Systems (2003) 61 pp., \$15.00
49	Yield to Bus Programs—State of the Practice (2003) 78 pp., \$16.00
50	Use of Rear-Facing Position for Common Wheelchairs on Transit Buses (2003) 42 pp., \$14.00
51	Transit Advertising Sales Agreements (2004) 99 pp., \$18.00
52	Transit Operator Health and Wellness Programs (2004) 80 pp., \$17.00
53	Operational Experiences with Flexible Services in Transit Systems (2004) 57 pp., \$16.00
54	Maintenance Productivity Practices (2004) 92 pp., \$18.00
55	Geographic Information Systems Applications in Transit (2004) 60 pp., \$16.00
56	Performance-Based Measures in Transit Fund Allocation (2004) 74 pp., \$16.00
57	Computer-Aided Scheduling and Dispatch in Demand-Responsive Transit Services (2004) 79 pp., \$17.00
58	Emergency Response Procedures for Natural Gas Transit Vehicles (2005) 53 pp., \$15.00
59	Strategic Planning and Management in Transit Agencies (2005) 44 pp., \$15.00
60	Practices in No-Show and Late Cancellation Policies for ADA Paratransit (2005) 49 pp., \$16.00
61	Maintenance Staffing Levels for Light Rail Transit (2005) 41 pp., \$16.00
62	Integration of Bicycles and Transit (2005) 70 pp., \$17.00
63	On-Board and Intercept Transit Survey Techniques (2005) 91 pp., \$19.00
64	Bus Use of Shoulders (2006) 91 pp., \$35.00
65	Transit Agency Participation in Medicaid Transportation Programs (2006) 48 pp., \$31.00
66	Fixed-Route Transit Ridership Forecasting and Service Planning Methods (2006) 51 pp., \$31.00
67	Bus Transit Service in Land Development Planning (2006) 62 pp., \$32.00
68	Methods of Rider Communication (2006) 95 pp., \$35.00
69	Web-Based Survey Techniques (2006) 104 pp., \$35.00
70	Mobile Data Terminals (2007) 150 pp., \$47.00
71	Paratransit Manager's Skills, Qualifications, and Needs (2007) 52 pp., \$36.00
72	Use of Biodiesel in a Transit Fleet (2007) 61 pp., \$38.00
73	AVL Systems for Bus Transit Update (2007) 104 pp., \$50.00
74	Policies and Practices for Effectively and Efficiently Meeting ADA Paratransit Demand (2008) 54 pp., \$40.00
75	Uses of Higher Capacity Buses in Transit Service (2008) 72 pp., \$45.00
76	Integration of Paratransit and Fixed-Route Transit Services (2008) 48 pp., \$40.00
77	Passenger Counting Systems (2008) 73 pp., \$45.00
78	Transit Systems in College and University Communities (2008) 88 pp., \$47.00
79	Light Rail Vehicle Collisions with Vehicles at Signalized Intersections (2008) 40 pp., \$37.00
80	Transit Security Update (2008) 141 pp., \$57.00
81	Preventive Maintenance Intervals for Transit Buses (2010) 71 pp., \$47.00
82	Transit Fare Arrangements for Public Employees (2010) 81 pp., \$49.00
83	Bus and Rail Transit Preferential Treatments in Mixed Traffic (2010) 202 pp., \$68.00
84	Current Practices in Greenhouse Gas Emissions Savings from Transit (2010) 77 pp. \$49.00
85	Effective Use of Citizen Advisory Committees for Transit Planning and Operations (2010) 63 pp., \$43.00
86	Relationships Between Streetcars and the Built Environment (2010) 52 pp., \$42.00
87	Practices in the Development and Deployment of Downtown Circulators (2011) 113 pp., \$57.00
88	Strollers, Carts, and Other Large Items on Buses and Trains (2011) 162 pp., \$63.00
89	Public Participation Strategies for Transit (2011) 87 pp., \$54.00
90	Video Surveillance Uses by Rail Transit Agencies (2011), 79 pp., \$52.00
91	Use and Deployment of Mobile Device Technology for Real-Time Transit Information (2011) 78 pp., \$49.00

Table 3 (Continued)

No.	Title/Pages/Price
92	Transit Asset Condition Reporting (2011) 45 pp., \$41.00
93	Practices to Protect Bus Operators from Passenger Assault (2011) 126 pp., \$60.00
94	Innovative Rural Transit Services (2011) 43 pp., \$41.00
95	Practices for Wayside Rail Transit Worker Protection (2012) 79 pp., \$54.00
96	Off-Board Fare Payment Using Proof-of-Payment Verification (2012) 117 pp., \$60.00
97	Improving Bus Transit Safety Through Rewards and Discipline (2012) 53 pp., \$46.00
98	Ridesharing as a Complement to Transit (2012) 62 pp., \$48.00
99	Uses of Social Media in Public Transportation (2012) 57 pp., \$48.00
100	Elevator and Escalator Maintenance and Safety Practices (2012) 58 pp., \$48.00
101	Implementation and Outcomes of Fare-Free Transit Systems (2012) 96 pp., \$57.00
43	Track Maintenance Costs on Rail Transit Properties (2008) (web-only doc)

Table 4 Index to TCRP Synthesis and Studies

Absenteeism	33, 52	
Accidents		– Automated Vehicle Location Systems 24, 34, 48, 53, 55, 94
– Light Rail	79	– Bicycle, Integration with 4, 62, 88
– Prevention	95	– Biodiesel 72
– Reduction	97	– Bypass Lanes 83
Advertising		– Cleaning 12
– Buses/Trains, on	32, 51	– College and University Campuses 39, 78
– Stations/Stops	32, 51	– Downtown Circulators 87
– Websites	43	– Driver Availability 33, 40, 52
Advisory Committees	85	– Electronic Equipment 44
Alternative Fuels	1	– Fare Collection 26, 96
– Safe Operating Procedures, Buses	1	– Fare-Free 101
Asset Management	92, 100	– Field Supervisors 16
Automated Onboard Systems, Vehicle Health	81	– Fuel and Fluid Storage 7
Automated Vehicle Location (AVL) Systems	24, 34, 48, 53, 55, 73, 77, 91, 93, 94	– Higher Capacity 75
Automatic Passenger Counters (APC)	29, 66, 73, 77	– Intercity 94
Automatic Vehicle Monitoring	24, 34, 48, 53, 55, 73	– Low-Floor 2
		– Maintenance 54, 81
		– Maintenance Facilities 7, 9, 12
		– Natural Gas 58
		– Occupant Safety 18, 38, 50, 58
		– Passenger Transfer 19
		– Rail, Integration with 83
		– Rapid Transit 75, 83
		– Retrofitting 8
		– Route Evaluation Standards 10
		– Safety 97
		– Service Line and Cleaning 12
		– Shoulders 64
		– Small Buses 41
		– Stops, Customer Information at 17, 37, 48
		– Strollers, Integration with 88
		– Suburb-to-Suburb Service 14
		– System-Specific Spare Ratios 11
Bicycles		
– Integration with Buses	4, 62	
– Integration with Ferries	4, 62	
– Integration with Rail	4, 62	
Biodiesel	72	
Buff Load (see Compression Requirements)		
Built Environment	86	
Buses		
– Alternative Fuels	1	
☐ Compressed Natural Gas	1	
☐ Ethanol	1	
☐ Liquefied Natural Gas	1	
☐ Liquefied Petroleum Gas	1	
☐ Methanol	1	

Table 4 (Continued)

– Traffic Operations	49	Design	
– Waste Control at Maintenance Facilities	9	– Bicycle Storage and Transport	62
Bus Field Supervisors		– Bus	
– Changing Roles and Practices	16	☐ Clean Air Regulations, to Meet	8
Bus Garages (see Bus Maintenance Facilities)		☐ Low-Floor Transit Buses	2
Bus Maintenance Facilities		☐ Safety	18, 50, 58, 93
– Cleaning	12	– Bus Maintenance Facilities	7
– Regulations on Design and Retrofit of	7	– Bus Stops	18
– Waste Control	9	– Elevators and Escalators	100
Bus Route Evaluation Standards	10, 14	– Engines	7, 8
Bus Stops		– Regulatory, Impacts on	7, 8
– Information at	17, 37, 48	– Small Buses	41
– Locations	53	– Streetcar Systems	86
– Safety Design	18	– Surveillance Technology	38
– Signs	17, 37	– Survey Questionnaires	63, 69
Claims (see Liability)		– Tunnels	23
Circulators	87	– Websites	43
Codes (see Regulations, Standards)		Dispatch	57
College and University Campuses	39, 78	– Bus	53, 60,
Communications		Diversity	
– Riders	68, 89	– Training	46
Commuter Benefits,	82	Driver	
Compression Requirements		– Health and Wellness	52
– Light Rail Vehicles	25	– Hiring	40
Computer-Aided Dispatch	73, 91, 93	– Performance Evaluation	40
Congestion Mitigation	84	– Retention	40
Construction Contract Claims	28	– Training	40, 44, 45, 49, 57
Contracts		Dynamic Message Signs	91
– Advertising	32, 51	Electronic Surveillance	38, 90
– Disputes and Resolution	28	Elevators	100
– Information Technology Services	35	Emergency Procedures	
– Maintenance	54	– Bus	58
– Paratransit Services	31, 71	Emissions, Greenhouse Gas	84
Cost-Effectiveness, Fare-Free Transit	101	Employee Assistance Programs	16, 52, 82
Customer Service	43, 45	Environment, The	
– Automatic Vehicle Location	73	– Clean Air Act	1, 7, 8
– Awareness	43, 45, 48, 49, 68	– Emissions, Biodiesel	72
– Bicycles on Transit	62	– Greenhouse Gas Emissions	84
– Complaint Resolution	38	– Waste Control	9
– Computer-Aided Scheduling and Dispatch	57, 91	Escalators	100
– Employee Fare Programs	82	Fare Collection	
– Geographic Information Systems	55	– Bus	26, 34
– Information at Bus Stops	17, 48	– Downtown Circulators	87
– Management Role	16, 47	– Electronic Registering Fareboxes (ERFs)	29
– Passengers with Disabilities	30, 31, 37, 50, 53, 60, 74	– Evasion	93, 96
– Passengers with Strollers, Carts and Other Large Items	88	– Fare-Free	101
– Public Participation	89	– Off-Board	96
– Service Line and Cleaning	12	– Unlimited Access Systems	39
– Surveys	63, 69	Ferries	
– Transfers	19	– Bicycles, Integration with	4, 62
		Fleet Management	15, 24, 35

Table 4 (Continued)

Flexible Transit Service	53	Liability	
Fixed-Route Transit	66, 74	– Construction Contract Claims	28
Fraudulent Claims	36	– Fraudulent Third Party Claims	36
Fuel Systems	72	– Institutional	49
Funding Allocation		– Risk Management	13
– Bicycle Services	62	Light Rail Vehicles (LRV)	
– Circulators	87	– Compression Requirements	25
– Infrastructure	92	– Operations	79
– Fare-Free Transit	101	– System-Specific Spare Ratios	15
– Maintenance	53	Light Rail Transit	61, 79, 83
– Medicaid Transportation Programs	65	– Fare Collection	96
– Performance-Based	56	Low-Floor Buses	2
– Role of Performance-Based Measures	6		
– Spare Bus Ratios, System-Specific	11	Maintenance	
– Spare Rail Vehicle Ratios	15	– Bus Maintenance Facilities	7, 9
– Surveillance	90	– Elevators and Escalators	100
– Systems Costs	48	– Light Rail Transit	61, 43 (web-only)
– Under ISTEA and TEA-21	42	– Line and Cleaning Functions	12
Funding, Flexible	42	– Monitoring Performance	22, 44
		– Preventive	81, 92
Geographic Information Systems	55	– Productivity	53, 54
Global Positioning Systems (GPS)		Management	44, 47, 59, 71
– Bus	24, 53, 73, 78, 91	Management Information Systems (see Information Technology)	
Greenhouse Gas Emissions	84	Marketing	
		– Bicycles on Transit	62
Incentive Programs		– Circulators	87
– Employee	3, 33, 52, 82	– Social Media	99
Information Technology (IT)	5, 35, 43, 57	Mobile Data Terminals	70
– Automatic Vehicle Location	73	Monitoring Maintenance Performance	22, 54
– Geographic Information Systems	55		
– Global Positioning Systems	70	Non-Emergency Medical Transportation	65
– Mobile Device Technology	91		
– Social Media	99	Paratransit Services	30, 31, 60, 65, 71, 74, 76
– Supervisors, Impact on	16	Parking and Storage	
– Web-Based Surveys	69	– Bicycles	62
Infrastructure	92	Partnerships,	65
Inspection		Passengers	
– Bus Maintenance	81	– Comfort	12
– Elevators and Escalators	100	– Communicating with	37, 68, 89
– Rail Tunnels and Underground Structures	23	– Information Display	91
– Track	95	– Ridership Counts	29, 34
Integrated Service	76, 98	– Safety	18, 21, 50, 58, 80, 88, 100
Intelligent Transportation Systems (ITS)		– Satisfaction	45, 64, 69, 101
– Advanced Public Transportation Systems (APTS)	35	– Transfer Systems	19
– Automated Vehicle Location Systems	24, 34, 48, 53, 55, 73, 77, 91	Performance-Based Measures	
– Automated Vehicle Monitoring (AVM)	24, 34, 48, 53, 55, 73	– Funding Allocation	56
– Automatic Passenger Counters	29, 34, 77	– Diversity Training	46
– Global Positioning Systems (GPS)	24, 53	– Role in Funding Allocation	6
– Transfer Automation	19	Performance Evaluation	
– Mobile Data Terminals	70	– Bus Operators	40
– Mobile Device Technology	91, 99	– Fare-Free Transit	101
Internet	43	– Circulators	87
		– Real-Time Bus Arrival Information Systems	43, 48, 91

Table 4 (Continued)

<ul style="list-style-type: none"> Planning – Advisory Committees 85 – Strategic 59 Policy Development – No-Show and Late Cancellation 60 – Greenhouse Gas Emissions 84 Policy Procedures – Rail Tunnel and Underground Structures Inspection 23 – Safe Operation for Alternative Fuel Buses 1 Productivity – Employee 3, 16, 22, 33, 54 – Proof-of-Payment 96 – Transit System 54, 56, 60 Public Involvement in Transit Planning 85, 89 Quality Assurance – Bus Maintenance 81 Queue Jump/Bypass Lanes 83 Rail – Bicycle, Integration with 4, 62 – Integration with Large Items 88 – Light Rail Vehicle Compression Requirements 25 – Passenger Transfers 19 – Security 21, 90 – Station Area Development 20 – Streetcars 86 – Suburb-to-Suburb Service 14 – System-Specific Spare Ratios 15 – Tunnel and Underground Structures 23 Real-Time Transit Information 91, 99 Recruitment – Bus Drivers 16, 33, 40 – Management 47 – Security Personnel 21 – Supervisors 16 Regulations – Air Quality 1, 7, 8, 84 – Alternative Fuel Buses 1, 72 – Americans with Disabilities Act (ADA) 2, 7, 16, 17, 24, 30, 31, 37, 50, 53, 60, 65, 74, 76 – Buses on Shoulders 64 – Drugs and Alcohol 16 – EPA 7 – Family Leave Medical Act 33 – Leave Policies 33 – Local and State 7 – Occupational Safety and Health Administration 7, 52 – Resource Conservation and Recovery Act 9 – Retrofitting 7, 8 – Suburb-to-Suburb Service 14 – Waste Management 9 	<ul style="list-style-type: none"> Retrofitting – Bus 8, 49 – Bus Maintenance Facilities 7 – Engine 7, 8 – Regulatory, Impacts on 7 Revenues – Advertising 51 Ridesharing 98 Ridership 63 – Fare-Free Transit 101 – Forecasting 66 Risk Management 90 – Medium Agencies 13 – Small Agencies 13 Safety – Alternative Fuel Bus Operation 1 – Bus Drivers 93 – Bus Occupant 18, 38, 50, 64 – Bus Route Evaluation 10 – Communications 68 – Light Rail Vehicle Compression Resistance 25 – Incentives and Rewards 97 – Infrastructure 92 – Track Workers 95 – Traffic Operations 49 – Video Surveillance 90 Scheduling – Adherence 49 – Automatic Vehicle Location Systems 24, 48, 53, 55, 73, 91 – Bus Driver Availability 33 – Bus Route Evaluation 10 – Bus Stop Information 17, 48 – Bus Transfers 19 – Computer-Aided 57 – Demand-Responsive 53, 57 – Downtown Circulators 87 – Elevators and Escalators 100 – Flexible Route 53 – Maintenance, Bus 81 – Paratransit 74, 76 – Point Deviation 53 – Ridesharing 98 – Ridership Data Collection 29, 34, 63 – Small Buses 41 – Social Media 99 – Suburb-to-Suburb 14 Security – Automatic Vehicle Location 73 – Bus Drivers, for 33, 93 – Crime Prevention 21, 38, 80 – Passenger Security Inspections 80 – Technology Systems 35, 38
---	---

Table 4 (Continued)

– Terrorism	27, 80	Training	
– Violence Reduction	21, 93	– Bus Drivers	18, 30, 40
Service		– Diversity Training	46
– Planning	66, 89, 94	– Information Technology	35, 44
– Quality	15, 45, 53, 57	– Management, Paratransit	71
– Small Buses	41	– Riders, Paratransit	74
Service Line and Cleaning	12	– Supervisors	16
Social Media, Uses of in Public Transportation	99	– Technicians	81
Spare Ratios		Transfers	19
– System-Specific Buses	11	Transit-Focused Development	20
– System-Specific Rail Vehicles	15	Transit, Integration with Ridesharing	98
Standards		Transit, Public Involvement	89
– Alternative Fuels	1	Transit, Security	90, 93
– Bus Route Evaluation	10, 14	Transit Signal Priority	83
– Maintenance	54	Transitways	83
State of Good Repair	92	Transportation Demand Management	39
Streetcars	86	Tunnels	23
Suburb-to-Suburb Commuting	14		
Supervisors		Underground Structures	23
– Bus Field	16	Unions	54
– Relations with Drivers	33	U-Pass	78
Surveillance	90		
Surveys		Vandalism	93
– On-Line and Intercept	63	Van Pools	98
– Web-Based	69	Video Surveillance	90
		Violence (see Security)	
Terrorism	27, 80		
Ticket Purchasing	96	Waste Control	
Tort Claims	36	– Bus Maintenance Facilities	9
Track Maintenance	43 (web-only), 95		



Transportation Research Board

500 Fifth Street, NW
Washington, DC 20001

THE NATIONAL ACADEMIES™

Advisers to the Nation on Science, Engineering, and Medicine

The nation turns to the National Academies—National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council—for independent, objective advice on issues that affect people's lives worldwide.

www.national-academies.org

Subscriber Categories: Public Transportation • Operations and Traffic Management • Design Planning and Forecasting • Vehicles and Equipment • Maintenance and Preservation • Energy Environment • Society • Finance



These digests are issued in order to increase awareness of research results emanating from projects in the Cooperative Research Programs (CRP). Persons wanting to pursue the project subject matter in greater depth should contact the CRP Staff, Transportation Research Board of the National Academies, 500 Fifth Street, NW, Washington, DC 20001.

COPYRIGHT INFORMATION

Authors herein are responsible for the authenticity of their materials and for obtaining written permissions from publishers or persons who own the copyright to any previously published or copyrighted material used herein.

Cooperative Research Programs (CRP) grants permission to reproduce material in this publication for classroom and not-for-profit purposes. Permission is given with the understanding that none of the material will be used to imply TRB, AASHTO, FAA, FHWA, FMCSA, FTA, or Transit Development Corporation endorsement of a particular product, method, or practice. It is expected that those reproducing the material in this document for educational and not-for-profit uses will give appropriate acknowledgment of the source of any reprinted or reproduced material. For other uses of the material, request permission from CRP.