LIGHT RAIL TRANSIT

U.S. Department of Transportation

September 1981

An Annotated Bibliography of Light Rail Transit

TECHNOLOGY SHARING REPRINT SERIES

Prepared for
California
Department of Transportation

AN ANNOTATED BIBLIOGRAPHY OF LIGHT RAIL TRANSIT*

*Light rail transit is a mode of urban transportation utilizing predominantly reserved but not necessarily grade-separated rights of way. Electrically propelled rail vehicles operate singly or in trains. LRT provides a wide range of passenger capabilities and performance characteristics at moderate costs. (Definition from Light Rail Transit: A State of the Art Review, U.S. Department of Transportation, Spring 1976.)

September 1981

State of California
Department of Transportation

Prepared by
Division of Transportation Planning

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Introduction

This Light Rail Transit (LRT) bibliography was compiled as a training tool as well as an information source for the California Department of Transportation (Caltrans). It is a companion publication to An Annotated Bibliography of Commuter/Regional Rail, February 1981, which was published and distributed through the U.S. Department of Transportation's Technology Sharing Program as DOT-1-81-7. The previously published document covers several categories which normally would be included in this document (i.e., Passenger Operations/Stations and Terminals). Both contain many citations which are common to all rail passenger services.

Caltrans, like many other states, as well as other governmental agencies, has recently become more involved with urban transportation systems. One of the inherent problems with such increased involvement is the difficulty of determining the state-of-the-art of particular modes--to use, among other things, as a reference point for any changes in service. It is my hope that this document will help solve this problem for LRT.

As was true of the first publication, this is the product of the work of a number of individual people as well as the Caltrans staff. Important input was obtained from the staff of the Transportation Research Board as well as several members of the Board's committees on Rail Transit Systems and State Role in Rail Transport. Valuable comments and suggestions were received from a variety of operating agencies, government sources, universities, and consultants. The editing was done on a volunteer basis by Benita H. Gray.

The Caltrans Transportation Library under the able direction of Phyllis Newton did their usual excellent job in locating referenced materials. The Word Processing section under Marj Wiley had the thankless, but critically important, task of getting all the information in the correct format.

Caltrans would welcome any comments or suggestions from users. Our prime hope is that this proves to be a useful, if not valuable, tool in efforts to upgrade and expand light rail transit services.

George E. Gray
Chief, Research and Development
Division of Transportation Planning
California Department of Transportation

GENERAL REFERENCES

Vuchic, Vukan R., Urban Public Transportation--Systems and Technology. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1981. 687 pp., Tabs., Figs., Photos., Refs., Glossary.

This is the first book covering engineering aspects of transit systems in the English language in several decades. The chapters are: History and Role of Transit in Urban Development, Urban Passenger Transport Modes, Vehicle Characteristics and Motion, Highway Transit Modes, Rail Transit Modes, New Concepts and Proposed Modes, Transit System Performance and Paratransit and Specialized Modes. Blending the theoretical aspects with practical facts and examples, the book is oriented toward both academic use (senior and graduate levels in Civil, and Mechanical Engineering, City Planning, Business curricula) and for professionals in city planning, transit agencies, consulting firms and government agencies. It contains 49 tables, 180 drawings and over 125 photographs. Each chapter has a Bibliography and Exercise questions. The appendices include an entirely new, convenient table for SI/English unit conversions, definitions of the basic terms and selected exercise answers.

Acknowledgement:
University of Pennsylvania

GLOSSARIES

Citizens Transit Design Committee and Howard R. Ross Associates, Light Rail Transit System for Pitkin County: Community Criteria and Recommendations for Final Design -- see Passenger Operations/Planning.

Dawson, W. R., and P. M. Dalton, Propulsion System Performance Requirements for Guided Urban Transit Systems -- see Propulsion Systems.

Vuchic, Vukan R., Urban Public Transportation -- Systems and Technology -- see General References.

PERIODICALS

To keep abreast of current activities in light rail transit, we suggest the following periodicals in addition to those listed in the commuter/regional rail bibliography.

Der Stadtverkehr. Verlag Werner Stock, Koessener Str. 11, 4800 Bielefeld 14, West Germany. Annual subscription, DM 44.

Electric Traction. Australian Electric Traction Association, Publishing Department, Box 1017, Sydney, N.S.W. 2001 Australia. Annual subscription, $13.50.

Headlights. Room 2650, Grand Central Terminal, 89 East 42nd Street, New York, N.Y. 10017. Annual subscription, $12.00.

International Railway Journal. P. O. Box 530, Bristol, Conn. 06010. Annual subscription, $23.00.

LRT News. Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418. Annual subscription, free.

Mass Transit, 555 National Press Building, Washington, D.C. 20045. Annual subscription (12 issues), $20.00.

Modern Tramway and Light Rapid Transit. Skybooks International, Inc., 48 East 50th Street, New York, N.Y. 10022. Annual subscription, $16.50.

Railway Gazette International, IPC Transport Press Ltd., Quadrant House, Sutton, Surrey, SM2 5AS, Great Britain. Annual subscription (12 issues), $31.20.

UITP Revue, UITP, Avenue de l'Uruguay 19, B-1050 Brussels, Belgium.

Verkehr und Technik, Erick Schmidt Verlag, Abt. V+T, Victoria Str. 44a, 4800 Bielefeld, W. Germany. Annual subscription ca. DM 110.

11 ADVANCED SYSTEMS

Chambliss, A., and others, Automated Guideway Transit Technical Data, prepared by the Mitre Corporation for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, April 1979. 124 pp., Tabs., Figs., App.

The intent of this compendium is to provide background data for general, management-level discussions of Automated Guideway Transit (AGT) programs, systems, and other urban transportation modes. Data are presented on general system characteristics, cost, energy and environmental issues for AGT, rapid rail, light rail, and transit bus systems. In addition, a summary of 19 Downtown People Mover (DPM) proposals is provided. Raw data and assumptions are supplied in an appendix to provide a base for additional study. Data are divided into four main sections: Section 1.0, AGT Overview, provides a perspective of AGT development through review of UMTA AGT programs, vehicles, guideway lane miles installed, and systems in use, proposed, or under construction; Section 2.0, Transportation System Economics, presents data on capital, operating and maintenance costs of various transportation modes (AGT, bus, rail, and light rail); Section 3.0, Energy and Environmental Issues, emphasizes energy consumption and energy resource supply and production allocations; Section 4.0, Downtown People Mover Summary, presents data from the proposals of 19 cities selected by UMTA for detailed evaluation in the DPM Project. The information includes city estimates of DPM capital cost, operating and maintenance cost, ridership, and operating hours. Raw data and background information used in calculating the system economic parameters of Section 2.0 and the energy consumption of Section 3.0 are provided in the Appendix.

Acknowledgement:
NTIS
PB 295095

RRIS 11 197459
UMTA-VA-06-0041-79-4
DOT-UT-50016

Finn, Nicholas, and John Morrall, "An Evaluation of Intermediate-Capacity Transit Technology" -- see Passenger Operations/Planning.

Miller, Vance E., Jr., Conceptual Design of a Light Rail Transit System for South Lake Tahoe -- see Passenger Operations/Planning.

11 ADVANCED SYSTEMS

Vuchic, Vucan R. and Richard M. Stranger, "New Transit Technologies: An Objective Analysis Is Overdue," Railway Gazette International, 130, no. 10 (October 1974), 384-87. Tab., Fig., Photos., Refs.

New urban transit systems incorporating inefficient and obsolete technical features are being promoted, discussed and funded. Typically they involve automatic operation with rubber tire guidance: rail systems which are clearly superior are concurrently ignored. The authors urge transit planners, operators and equipment manufacturers to exploit the great potential of rail technology rather than pursuing innovation for its own sake.

Acknowledgement:
Railway Gazette International

RRIS 11 072856

26 BIBLIOGRAPHY AND DOCUMENTATION

Railroad Research Information Service, Special Bibliography: Safety-Related Technology -- see Safety.

Starbuck, James C., Light Rail Transit: A Chronological Bibliography, 1971-1975, Mrs. Mary Vance, ed., Council of Planning Librarians Exchange Bibliography 964. Monticello, Ill.: Council of Planning Librarians, January 1976. 10 pp.

This bibliography includes a short history of light rail transit and 81 references about light rail transit published in the 1971-75 time period.

18 ECONOMICS

(See also Energy, Socioeconomic Factors, and Passenger Operations/Costs/Planning)

Carter, Stephen A., "Joint-Development Potential for Light-Rail Systems" -- see Passenger Operations/Land Use and Development.

Chambliss, A., and others, Automated Guideway Transit Technical Data -- see Advanced Systems.

Coles, Darcy E., "Financing a Modernization Program," Transit Journal, 6, no. 3 (Summer 1980), 35-40.

This article details the federal, state, and local sources of funds for the San Francisco Muni's modernization. It also outlines the strategies which the Public Utilities Commission and Muni use to ensure that these revenues are utilized efficiently.

Diamant, E.S., and others, Light Rail Transit: (A) State of the Art Review -- see Passenger Operations/Planning.

Dyer, T. K., and others, Rail Transit System Cost Study, Final Report, Revision 1, May 1974-July 1975, prepared by Thomas K. Dyer, Inc., for the Transportation Systems Center and the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, March 1977. 111 pp., Tabs., Figs. This document supersedes Rail Transit System Cost Study, PB 254627.

The primary objective of this study is to develop up-to-date estimates of the various cost elements encountered in constructing, operating, and maintaining urban rail transportation systems. This document reports the findings of a study to determine current costs for construction, operation, and maintenance of urban light rail vehicles, rapid transit, and commuter rail systems. The intent herein is to develop cost information that would be useful to transportation planners, policy makers, and others involved in the preliminary evaluation and selection of rail transportation alternatives.

18 ECONOMICS

Factors influencing appreciable cost variations in construction and operations were reviewed and included as criteria for cost projections.

Acknowledgement:
NTIS
PB 266918

RRIS 18 157207
UMTA-MA-06-0025-77-12
DOT-TSC-UMTA-75-2
REV. 1

Krzyczkowski, Roman, and others, Integration of Transit Systems, Summary -- see Passenger Operations/Intermodal Integration.

McClure, Miriam Daum, "Putting Together a Light Rail Financing Package," Transit Journal, 6, no. 3 (Summer 1980), 13-22.

This article details the political processes entailed in developing an acceptable funding package for the Banfield Transitway Project in Portland, Oregon. It covers the history of the project since 1975.

McGean, T. J., and others, Cost Savings Potential of Modifications to the Standard Light Rail Vehicle Specification -- see Rail Vehicles and Components.

New York City Department of City Planning, Light Rail Transit, Financial Feasibility, 42nd Street Case Study, Interim Technical Report prepared for the Federal Highway Administration and the Urban Mass Transportation Administration. New York: New York City Department of City Planning, January 1979. 33 pp., Figs., Photos., Refs.

This report's main purpose is to illustrate the concept of light rail transit; to stress its costs, benefits, and impacts. A major portion of the report is devoted to financial feasibility.

Saurenman, Hugh J., Robert L. Shipley, and George Paul Wilson, In-Service Performance and Costs of Methods to Control Urban System Noise -- see Environmental Protection.

Scheelhaase, K., "The Status of German Light-Rail Systems" -- see Passenger Operations/Level of Service.

18 ECONOMICS

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited" -- see Passenger Operations/Marketing.

Tennyson, E. L., "Public Considerations of the Economics and Marketing of Light Rail Transit" -- see Passenger Operations/Marketing.

13 ELECTRIFICATION

(See also Track and Structures and Passenger Operations/ Planning)

Touton, R. D., Jr., "Electrification and Control Systems for Light Rail Systems" -- see Signals, Control, and Communication.

Wolff, Gerhard, and William B. Waite, "Power Supply for Light-Rail and Rapid Transit Systems in Germany," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 142-49. Washington, D.C.: Transportation Research Board, 1978. Figs., Photos., Refs.

The purpose of this paper is to define the present state of the art in the design of the power supply for light-rail and rapid transit systems in Germany. The scope includes the incoming alternating-current switchgear, rectifier direct-current switchgear, catenary, and third-rail systems, as well as the breaker on the light-rail vehicle. Attention is paid to the problems of coordinating the various components of standard design and of dealing with corrosion due to the leakage of current from the power supply. Experiences with various catenary designs and their interconnections in Germany are also described. This paper is limited to experience in Germany, and the underlying design criteria are based on German electrical regulations. Since the implementation and reliability of power supply for light-rail and rapid transit systems in Germany are considered to be highly successful, the data, views, and experience presented in this paper should be of interest in North America. /Author/

Acknowledgement RRIS 13 301322
TRB
PB 288949

16 ENERGY

(See also Passenger Operations/Planning and specific topics)

Chambliss, A., and others, Automated Guideway Transit Technical Data -- see Advanced Systems.

Schumann, John W., "Light Rail--Its Potential Grows" -- see Passenger Operations/Level of Service.

10 ENVIRONMENTAL PROTECTION

(See also Passenger Operations/Planning and specific topics)

Armour, Audrey, and Reg Lang, Impacts of Urban Railways -- see Socioeconomic Factors.

Chambliss, A., and others, Automated Guideway Transit Technical Data -- see Advanced Systems.

Kurzweil, L. G., and W. N. Cobb, Urban Rail Noise Abatement Program: A Description, prepared by the Transportation Systems Center for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, April 1979 (cover - March 1979). 26 pp., Figs., Refs.

This report presents the background, current activities, and future plans for the Urban Rail Noise Abatement Program. This program, sponsored by the Office of Technology Development and Deployment of the Urban Mass Transportation Administration (UMTA) was initiated in 1972 and has been technically managed since its inception by the Transportation Systems Center. The problem of urban rail noise and vibration is described and the rationale for the UMTA funded program is given. The body of the report presents a definition of the program objectives, a discussion of the program organization, and a description of past, current, and future program activities. Major accomplishments of the program to date are listed in the final section.

Acknowledgement:
NTIS
PB 295545

RRIS 10 197522
UMTA-MA-06-0099-79-1
DOT-TSC-UMTA-79-23

Metropolitan Transit Development Board, Executive Summary of the Guideway Project EIR. San Diego, Calif.: Metropolitan Transit Development Board, n.d. v.p., Tabs., Figs., Refs.

This summary of the EIR for the San Diego light rail project is presented in five sections. Section I includes background on the environmental process for the project. Section II provides MTDB's responses to significant environmental points raised in the draft EIR review process, including a description of the project and the environmental setting, land use and transportation planning, an assessment of impacts, and the presentation of alternatives. Sections III

and IV list the resources utilized (persons, organizations, reports, and studies). Section V reproduces the public notice forms used.

Oregon Department of Transportation and Tri-Met, Banfield Transitway Preferred Alternative Report. Multnomah County, Ore., May, 1979. 104 pp.

This document was submitted to the Urban Mass Transportation Administration by the Oregon Department of Transportation and Tri-Met, including:

(1) Staff Recommendation to the Tri-Met Board of Directors on the Banfield Transitway Project. This is the basic report which documents the mode and alignment recommendations. It gives the reasons for light rail's superiority over other project alternatives, describes the background of transportation planning in the Portland area, and details the specific project proposal.

(2) The Banfield Transitway Decision Process describes how the decision was made by local jurisdictions during the fall of 1978. Also included are the specific resolutions adopted by each jurisdiction.

(3) Response to UMTA Technical Questions, Banfield Transitway Project. This report discusses a number of technical points raised by UMTA over the past year, including details of the modeling process and assumptions used in estimating operating costs of the light rail system.

_____, Draft Environmental Impact Statement on Banfield Transitway, Vol. I, prepared for the Federal Highway Administration. Multnomah County, Ore., February, 1978. 398 pp.

This Draft Environmental Impact Statement explains alternatives studied for 1975-1978 and their environmental impacts.

FHWA-OR-EIS-78-3-D

10 ENVIRONMENTAL PROTECTION

_____, Final Environmental Impact Statement on the Banfield Transitway Project: Light Rail Transit Line and Banfield Freeway Improvements, prepared for the Urban Mass Transportation Administration and the Federal Highway Administration. Multnomah County, Ore., August, 1980. 492 pp.

This report describes a joint freeway widening and light rail transit construction project. Alternatives which were analyzed are explained and environmental impacts of the chosen alternative detailed.

FHWA-OR-EIS-78-3-F
UMTA-OR-23-9001

Rudd, M. J., "Wheel/Rail Noise--Part II: Wheel Squeal," Journal of Sound and Vibration, 46, no. 3 (1976), 381-94. Figs., Refs.

A model is presented for the intense pure-tone noise generated by American subway cars and German trams when traversing tight curves. Squeal is presumed to arise from lateral crabbing of the wheels across the rail head, which results from the finite length of the truck (or bogie). This lateral sticking and slipping causes vibrations in the wheel to increase until a stable amplitude is reached. The stick-slip mechanism is described by a negative damping coefficient that varies with vibration amplitude. The model is used to predict the intensity of wheel squeal as a function of train speed, curve radius, and truck length. Damped and resilient wheels were tested and found effective at reducing wheel squeal.

Acknowledgement:
Journal of Sound and Vibration

RRIS 10 141503

Rylander, R., and others, "Tramway Noise in City Traffic," Journal of Sound and Vibration, 51, no. 3 (1977), 353-58. Tabs., Figs., Refs.

The extent of annoyance was studied in populations exposed to various levels of mixed tramway and motor traffic noise. The respondents were able to distinguish between the annoyance caused by the two

types of traffic. With an increasing number of heavy vehicles annoyance due to traffic noise increased more than annoyance due to tramway noise in mixed city traffic.

Acknowledgement: RRIS 10 157678
Journal of Sound and Vibration

Saurenman, Hugh J., Robert L. Shipley, and George Paul Wilson, In-Service Performance and Costs of Methods to Control Urban Rail System Noise, Final Report, prepared by the Transportation Systems Center; Wilson, Ihrid & Associates; and De Leuw, Cather & Co. for the Urban Mass Transportation Administration, Washington, D.C.: U.S. Department of Transportation, December 1979. 138 pp., Tabs., Figs., Photos., Refs., Apps.

This study evaluates the acoustic and economic effectiveness of five methods of controlling wheel/rail noise and vibration on urban rail transit systems, namely: rail grinding, wheel truing, resilient wheels, ring-damped wheels, and welded vs. jointed rail. The noise reduction methods were tested under revenue operation conditions on the Market-Frankford Line of the Southeastern Pennsylvania Transit Authority rail transit system. In addition to the evaluation of these noise control methods, the study included an economic analysis of the long and short term costs of the control methods if implemented on typical U.S. urban rail systems. Life-cycle cost equations were developed for the control methods. This report summarizes noise, vibration, and cost results and compares the measurement results with similar studies. See also PB-288838.

Acknowledgement: RRIS 10 305891
NTIS UMTA-MA-06-0099-80-1
PB 80 129216 DOT-TSC-UMTA-79-43

Strickland, Lester R., Self-Service Fare Collection--Functional Specifications -- see Passenger Operations/Fares and Revenue Collection.

25 GOVERNMENT POLICY, PLANNING, AND REGULATION

(See also History and Passenger Operations/Planning)

Armour, Audrey, and Reg Lang, Impacts of Urban Railways -- see Socioeconomic Factors.

California Public Utilities Commission, Rules for the Design, Construction and Operation of Light Rail Transit Systems Including Streetcar Operations -- see Safety.

Chambliss, A., and others, Automated Guideway Transit Technical Data -- see Advanced Systems.

Diamant, E. S., and others, Light Rail Transit: (A) State of the Art Review -- see Passenger Operations/Planning.

General Motors, "The Truth About 'American Ground Transport'--A Reply by General Motors," The Industrial Reorganization Act: Hearings Before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, United States Senate, 93rd Congress, Second Session on S. 1167, Part 4A--Appendix to Part 4, pp. A-107 to A-144, printed for the use of the Committee on the Judiciary. Washington, D.C.: U.S. Government Printing Office, 1974. Refs., App.

This reply to "American Ground Transport" repudiates that paper's assertions that General Motors assisted the Nazis, suppressed rail transportation, and destroyed street railway systems. It includes an appendix of fourteen related articles published in 1974.

Groche, G., "Light Rail: A Transport System for the Future" -- see Passenger Operations/Level of Service.

Hanson, Barbara J., "Railroad and Transit Joint Use of Right-of-Way: Institutional and Legal Problems--An Overview," Transit Law Review, Summer 1979, pp. 5-12. Photo., Refs.

This article examines issues involved in adapting lightly used railroad lines for transit corridors. It discusses four types of such services: inter-urbans, commute and line haul passenger service with, freight, rapid transit with railroad, and light rail with railroad. It covers legal, institutional, and

regulatory problems by reviewing physical, labor, and operating considerations.

Herringer, Frank C., "Light Rail Transit: An Urban Transportation Alternative" -- see Passenger Operations/Costs.

Kurzweil, L. G., and W. N. Cobb, Urban Rail Noise Abatement Program: A Description -- see Environmental Protection.

Snell, Bradford C., American Ground Transport: A Proposal for Reconstructing the Automobile, Truck, Bus, and Rail Industries. Washington, D.C.: U.S. Government Printing Office, February 1974. 103 pp., Tabs., Photos., Refs. Also found in The Industrial Reorganization Act: Hearings Before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, United States Senate, 93rd Congress, Second Session on S. 1167, Part 4A--Appendix to Part 4, pp. A-1 to A-103, printed for the use of the Committee on the Judiciary. Washington, D.C.: U.S. Government Printing Office, 1974.

This report, which was presented to a Senate Subcommittee, is primarily concerned with competition in the transportation industry. It contains sections on the demise of street railway and interurban electric railway systems, on the political opposition to rapid transit, and on the replacement of New Haven electric locomotives by diesels. The report blames the economic power of certain auto makers for many of the present-day transportation problems in the U.S.

RRIS 25 052067

Verband Deutscher Elektrotechniker, e.V., Regulations for Electric Railways, translations of VDE specifications, 1971, VDE 0115/3.65 (Engl.). Berlin, West Germany: VDE-Verlag GMBH, n.d. 83 pp., Tabs., Fig.

These regulations cover both construction/manufacture and operations. The construction/manufacture area is divided into protective measures, vehicles and their operational components, and fixed railway installations.

19 HISTORY

(See also Passenger Operations/Planning)

Buckley, R. J., A History of Tramways: From Horse to Rapid Transit. North Pomfret, Vt.: David & Charles, Inc., 1975. 184 pp., Figs., Photos., Refs.

The first four chapters of this book take the reader from the horse tramways through the various types of mechanical traction and the early electric tramcar to the standard tram and its variations. Chapter Five covers the American interurban and the European rural and interurban light railway. The next chapter discusses "modernization", including the American PCC car. The chapter entitled "The Rapid Tramway" includes, e.g., European PCC, articulated and one-man trams, reserved tracks, and traffic restraint. The final chapter addresses up-grading of tramways, tramways in a secondary role, and tramway museums.

Carlson, S. P., and others, PCC--The Car That Fought Back -- see Rail Vehicles and Components.

Demoro, Harre, "The PCC Car--Still a Good Idea," Mass Transit, 2, no. 6 (June 1975), 14-15, 29. Fig.

This article describes the organization and activities of the Electric Railway Presidents' Conference Committee which developed the PCC car. It covers the various improvements achieved in the original vehicle and outlines its future development.

Elmberg, Curt M., "Threats to Light Rail: A Case Study of Counter Measures," Modern Tramway and Light Rapid Transit, 42, no. 500 (August 1979), 265-71. Figs., Photos.

This article provides a chronicle of the ups and downs of the development of light rail transit in Goteborg, Sweden, since the 1920s. It includes details of the measures taken to avert the various threats to the survival of the system.

General Motors, "The Truth About 'American Ground Transport'--A Reply by General Motors" -- see Government Policy, Planning, and Regulation.

19 HISTORY

Hirshfeld, C. F. (cover - Hirschfeld, C. F.), The Electric Railway Presidents' Conference Committee Streetcar Research and Development Program: Five Technical Bulletins, 1931-1933 -- see Rail Vehicles and Components.

Kashin, Seymour, "Light Rail Transit--Past, Present or Future," Mass Transit, 2, no. 6 (June 1975), 10-11, 18. Figs.

This article recounts the history of light rail transit from the earliest street railway operations. It includes an illustration of a streetcar indicating its various parts and their names.

McKay, John P., Tramways and Trolleys: The Rise of Urban Mass Transport in Europe. Princeton, N.J.: Princeton University Press, 1976. 283 pp., Tabs., Figs., Photos., Refs.

This book is an historical and statistical investigation of the growth of the European electric tramway industry between 1890 and 1910 with primary focus on France, Germany and Great Britain. Data is evaluated in terms of three basic sociological disciplines: development, diffusion and public management of technology and innovation; patterns of entrepreneurship and economic activity; and the impact of transportation changes upon the urban environment. Conclusions are drawn concerning these and inferences are made about the future. Discussing technological innovation, it is observed that such movements that have vast consequences for society cannot be allowed to run wildly on the basis of what is presently cheapest and most dependable, without proper regard for long-term cost and related negative consequences.

RRIS 19 153063

Miller, John Anderson, Fares, Please! From Horse-Cars to Streamliners. New York: D. Appleton-Century Company, Incorporated, 1941. 222 pp., Figs., Photos., Refs.

This is the story of public passenger transportation in cities from the horse-drawn omnibus to urban transportation of the 1940s. The stories of the horse-drawn omnibus, the horse-car, the

cable-car, the early electric car, the elevated railway, the subway, the motor-bus, and the trolley-bus are presented in separate chapters.

Other chapters describe the mergers and expansion in the heyday of the trolley and how emergencies, such as fires and storms, are met. Another chapter tells of unusual types of transit. The final chapter deals with transit today, i.e., the 1940s, and in the future (from the perspective of the '40s).

Mills, James R., "Light Rail Transit: A Modern Renaissance" -- see Passenger Operations/Rail Cars and Equipment.

Perles, Anthony, and others, The People's Railway: The History of the Municipal Railway of San Francisco. Glendale, Calif.: Interurban Press, 1981. 260 pp., Ill., Maps, Ports., Refs.

From its beginning as America's pioneer city-owned street railway in 1913, the "Muni" has developed into today's fascinating transit system, which operates cable cars, surface car lnes, trolley coaches and a new light rail subway. Its history is filled with political battles and engineering marvels.

ISBN 0-916374-42-4

Rowsome, Frank Jr., and Stephen D. Maguire (Technical Editor), Trolley Car Treasury. New York, N.Y.: McGraw-Hill Book Company, Inc., 1956. 200 pp., Photos, other illustrations.

This book is a popular history of the development of the streetcar with considerable discussion of predecessor horsecars, steam-driven and cable cars. A considerable number of drawings and photographs are used along with historical anecdotes. The first four chapters trace the streetcar's antecedents, the next three describe development of the electric streetcar, and the final four chapters treat interurbans, the golden age of electric powered mass transportation, and the industry's decline resulting from automobile competition, changing urban patterns, and other economic factors.

Silien, Joseph S., and Jeffrey G. Mora, "North American Light Rail Vehicles" -- see Rail Vehicles and Components.

Snell, Bradford C., American Ground Transport: A Proposal for Reconstructing the Automobile, Truck, Bus, and Rail Industries -- see Government Policy, Planning, and Regulation.

07 HUMAN FACTORS

McInerney, F. T., The Feasibility of Retrofitting Lifts on Commuter and Light Rail Vehicles, prepared by the Technology and Analysis Corp. for the Transportation Systems Center. Washington, D.C.: U.S. Government Printing Office, September 1980. 138 pp., Tabs., Figs., Photos., Refs., App.

The major objectives of this study were to determine if lift retrofit applications to rail vehicles are technically feasible, and if so, the extent to which existing bus lift technology can be utilized. This report examines some of the technical issues associated with the retrofitting of lifts for elderly and handicapped (E&H) passengers on light and commuter rail vehicles. There are four major sections to this report. The first section develops the inventory of light rail (LR) and commuter rail (CR) vehicles in the U.S. by number and type. It addresses the characteristics of rail vehicles that differentiate them from buses and makes preliminary indications of which vehicles might be preferable candidates for lift retrofits. The second section assesses the existing bus lift technology. Descriptions of lift designs and operation obtained from manufacturers are presented. The third major section of this report develops the interface requirements between lifts and vehicles based on existing vehicle characteristics and on lift kinematic concepts. The final section examines ancillary issues of lift retrofits on rail vehicles, such as ancillary hardware modifications, safety and liability concerns, and concerns about costs and sources of required funding. This study found that it was technically feasible to retrofit lifts on several types of LR and CR vehicles, drawing substantially on existing bus lift technology. This report contains a list of references and numerous charts illustrating lift technology of manufacturers.

Acknowledgement: UMTA-MA-06-0025-80-11
NTIS DOT-TSC-UMTA-80-39
PB 81 130684

Rylander, R., and others, "Tramway Noise in City Traffic" -- see Environmental Protection.

24 INDUSTRY STRUCTURE AND COMPANY MANAGEMENT

(See also Passenger Operations/Planning)

Buchanan, D. A., Final Report on the Study and Evaluation of the Maintenance Operations of the San Francisco Municipal Railway (cover title - A Study of the San Francisco Municipal Railway: Maintenance Operations), conducted by the Urban Transportation Development Corporation, Ltd., for the Budget Bureau of the Board of Supervisors of the City and County of San Francisco. n.p.: Urban Transportation Development Corporation, Ltd., December 8, 1976. 77 pp., Tabs., 13 App.

> Recommendations are made to correct San Francisco Muni's poor maintenance performance and the poor management of limited resources. Action plans to recover and sustain maintenance effectiveness are presented.
>
> O & E/DEV/063

Downey, Paul J., User's Guide for the Interactive Scheduling Program: Preliminary Calendar Version -- see Rail Vehicles and Components.

Elmberg, Curt M., "Threats to Light Rail: A Case Study of Counter Measures" -- see History.

Krzyczkowski, Roman, and others, Integration of Transit Systems, Summary -- see Passenger Operations/Intermodal Integration.

Scott, P. D., "Fort Worth's Privately Owned Subway System" -- see Passenger Operations/Marketing.

Schwartz, Arthur, and John D. Wilkins, "Use of Railroad Rights-of-Way for Light-Rail Transit Systems," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 124-30. Washington, D.C.: Transportation Research Board, 1978. Tab., Figs., Refs.

> This paper describes the conditions that are required for railroad rights-of-way to be usable for light-rail transit. Some of the locational characteristics of desirable rights-of-way are described. A method for analyzing railroad use

and physical characteristics is presented. Several solutions to problems in using railroad rights-of-way are outlined. The design parameters for joint use of rights-of-way are explored. /Author/

Acknowledgement:
TRB
PB 288949

RRIS 24 301319

Sullivan, Brian E., "Route Layout Philosophy and Service Coordination Particularly for Light Rail Transit" -- see Passenger Operations/Level of Service.

Wilbur Smith and Associates, San Francisco Muni Transportation Project: Planning, Operations, Marketing -- see Passenger Operations/Level of Service.

23 PASSENGER OPERATIONS/COSTS

(See also Economics, Passenger Operations/Planning, and specific topics)

Beetle, George R., "Light Rail Transit Construction Costs," Light Rail Transit, Special Report 161, pp. 115-21. Washington, D.C.: Transportation Research Board, 1975.

Light rail transit has attractive service characteristics that can be secured in most cities for modest investments. The relatively low construction costs of light rail transit are due primarily to avoiding large civil works by relying instead on reserved rights-of-way at grade. Many options are available for alignments at grade, and costs for way reservation can vary widely. This paper describes the construction costs for modern light rail transit; it takes into consideration way reservation and the more predictable costs for stations, street crossings, track, cars, electrification, signals, communications, and other requirements. The costs presented are estimates, based on the experience of the author in recent evaluations of light rail transit for several U.S. cities. Few new light rail facilities have been built in the United States in recent years; therefore, little opportunity exists for relating estimates of this type to actual construction. Figures discussed here range from high to low where convenient, and single estimates presented are conservative representations of the largest values likely to be experienced in most cities. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129818
TRB
PB 249150

DeGraw, Ronald, "Operating and Maintenance Costs of Light Rail Transit," Light Rail Transit, Special Report 161, pp. 122-25. Washington, D.C.: Transportation Research Board, 1975. Refs.

This paper explains the costs of operating light rail lines, and it explains how light rail can be more economical than other modes under certain conditions. Using 3 recent studies of proposed light rail lines as examples, the paper shows that new lines can be economically constructed and operated with a potential

ridership of as little as 20,000 daily passengers. The self-service fare systems used on European light rail lines is explained, and an opinion is given recommending that such a system could be implemented on new light rail lines built in the United States. Relatively fixed maintenance costs, high passenger- to-operator ratios, and multiple-unit capabilities make traffic increases on light rail lines much more economical to accommodate than on bus lines. The paper details how light rail lines have high passenger carrying capabilities (as much as 20,000 passengers/h) yet need relatively low passenger loads (only 20,000 passengers/day) to economically justify implementation and still have sufficient revenue to cover all operating costs. Also discussed are the ease of implementation, the versatility of the mode, and passenger acceptance and preference. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129819
TRB
PB 249150

Herringer, Frank C., "Light Rail Transit: An Urban Transportation Alternative," Light Rail Transit, Special Report 161, pp. 16-18. Washington, D.C.: Transportation Research Board, 1975.

The Urban Mass Transportation Administration expects federal policy for investment in major urban transportation projects to lead to a rational allocation of limited resources. This is not a new concept and analysis on the basis of cost effectiveness by both federal and local agencies should encourage more cities to consider light rail as an alternative. Light rail on exclusive right of way can be an attractive competitor to the automobile. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129807
TRB
PB 249150

Sacramento Regional Transit District, Light Rail--Transit Solution for Sacramento (cover - Light Rail Transit for

Sacramento). Sacramento, Calif.: Sacramento Regional Transit District, revised April 22, 1981. 25 pp., Tabs., Figs.

This report presents an operator's view of the case for light rail transit as part of today's public transportation system, specifically in Sacramento, California. It describes the present-day transit situation, the expected growth in the community, and future concerns. It outlines an integrated system with light rail acting as the core along three corridors. It also covers cost-effectiveness, cost comparisons with an expanded bus fleet, and funding.

Transportation Research Board, A Report on Light Rail Transit: Surface Operations, Final Report, prepared for the Urban Mass Transportation Administration Office of Policy and Program Development. Washington, D.C.: Transportation Research Board, April 1980. 31 pp., Tabs., Figs., Refs.

This report recognizes the fact that the high costs of segregated fixed-guideway transit have dampened LRT's popularity. As a result, the Transportation Research Board (TRB) and UMTA decided to conduct an examination of the obstacles to lower-cost surface configurations. Toward this end, a by-invitation-only seminar was convened in Washington, DC, on December 5-6, 1978. Its objective was to trace specific problems and to propose where effort toward their solution should be most effectively directed. These problems were expressed as a set of issues that served to focus thought and guide proceedings. This report contains three background papers as well as the summary of discussions on the impact of alignment options, traffic-engineering requirements, safety requirements, safety requirements for installation and operation requirements for passenger stop locations, intermodal interface, fare-collection options for surface operation, and future actions.

Acknowledgement:
TRB
PB 80 197700

RRIS 23 318430
UMTA-DC-06-0216-80-1

23 PASSENGER OPERATIONS/FARES AND REVENUE COLLECTION

(See also Economics and Passenger Operations/Planning)

Deibel, Lawrence E., Self-Service Fare Collection, Vol. III: Hardware Considerations, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, September 1979. 78 pp., Tabs., Photos., Refs., Apps.

Interest in the European system of fare collection for urban transit broadly known as Self-Service Fare Collection (SSFC) has been growing in the U.S. The European experience indicates that SSFC promotes greater operating efficiency and improved service delivery. The common features of SSFC--self-monitoring, fare payment, receipts, ticket inspection and penalties--represent substantial departures from the current operating procedures and existing legal powers of U.S. transit systems. This 4-volume study, sponsored by the Urban Mass Transportation Administration, discusses the European SSFC system and the relative merits of the alternative approaches to self-service with respect to their application in the United States.

Volume I of this study describes the European approach to and rationale for self-service fare collection; documents the experience European transit systems have had with using and enforcing these procedures; and discusses the relative merits of the alternative approaches to self-service with respect to their application in the United States. Volume II summarizes the information obtained from eleven European transit properties and one Canadian property. Volume III describes the equipment commonly used to support self-service operations in Europe and discusses the policy and design options which are presented during the selection and specification of equipment for self-service operations. Volume IV summarizes the legal issues of self-service operations in the U.S. transit environment; it also addresses labor, economic, liability, and accessibility issues of self-service in U.S. applications.

Acknowledgement:
NTIS
PB 80 132277

UMTA-VA-06-0049-79-4
MTR-79W00087 03

23 PASSENGER OPERATIONS/FARES AND REVENUE COLLECTION

_____, Self-Service Fare Collection: Ticketing Procedures in Self-Service Systems, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Government Printing Office, 1980 (Report date - February 1980). 40 pp., Tabs., Figs., Refs.

Self-Service Fare Collection is common practice in most European cities and is beginning to be considered by a number of U.S. transit operators. In most self-service systems, the driver is relieved of most of the responsibility for fare collection and of all the responsibility for the monitoring of fare payment. Instead, the passenger is responsible for the payment of the proper fare and this payment is randomly enforced by special transit personnel. Several demonstrations of this fare collection technique are being planned and supported by the Office of Service and Methods Demonstration, Urban Mass Transportation Administration.

Self-service systems are characteristically ticket-oriented systems. Nearly all self-service systems use special devices which passengers can use directly to "validate" these tickets for trips in the transit system. However, self-service systems represent a broad range of ticket types from which to choose. The common approaches to self-service ticketing are reviewed and the relative merits of different ticket types and ticketing approaches are discussed.

Acknowledgement: UMTA-VA-06-0049-80-1
NTIS MTR-79W00451

_____, Self-Service Fare Collection, Vol. I: Review and Summary, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, August 1979. 90 pp., Tabs., Refs., Apps.

Interest in the European system of fare collection for urban transit broadly known as Self-Service Fare Collection (SSFC) has been growing in the U.S. The European experience indicates that SSFC promotes greater operating efficiency and improved service delivery. The common features of SSFC--self-monitoring, fare payment, receipts, ticket inspection and penalties--represent substantial departures

from the current operating procedures and existing legal powers of U.S. transit systems. This 4-volume study, sponsored by the Urban Mass Transportation Administration, discusses the European SSFC system and the relative merits of the alternative approaches to self-service with respect to their application in the United States.

Volume I of this study describes the European approach to and rationale for self-service fare collection; documents the experience European transit systems have had with using and enforcing these procedures; and discusses the relative merits of the alternative approaches to self-service with respect to their application in the United States. Volume II summarizes the information obtained from eleven European transit properties and one Canadian property. Volume III describes the equipment commonly used to support self-service operations in Europe and discusses the policy and design options which are presented during the selection and specification of equipment for self-service operations. Volume IV summarizes the legal issues of self-service operations in the U.S. transit environment; it also addresses labor, economic, liability, and accessibility issues of self-service in U.S. applications.

Acknowledgement: UMTA-VA-06-0049-79-2
NTIS MTR-79W00087 01
PB 80 132251

Eiseman, Gloria G., Self-Service Fare Collection, Vol. IV: Legal and Labor Issues, prepared by the MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, August 1979. 59 pp., Refs.

Interest in the European system of fare collection for urban transit broadly known as Self-Service Fare Collection (SSFC) has been growing in the U.S. The European experience indicates that SSFC promotes greater operating efficiency and improved service delivery. The common features of SSFC--self-monitoring, fare payment, receipts, ticket inspection and penalties--represent substantial departures from the current operating procedures and existing legal powers of U.S. transit systems. This 4-volume study, sponsored by the Urban Mass Transportation Administration, discusses the European SSFC system and the

relative merits of the alternative approaches to self-service with respect to their application in the United States.

Volume I of this study describes the European approach to and rationale for self-service fare collection; documents the experience European transit systems have had with using and enforcing these procedures; and discusses the relative merits of the alternative approaches to self-service with respect to their application in the United States. Volume II summarizes the information obtained from eleven European transit properties and one Canadian property. Volume III describes the equipment commonly used to support self-service operations in Europe and discusses the policy and design options which are presented during the selection and specification of equipment for self-service operations. Volume IV summarizes the legal issues of self-service operations in the U.S. transit environment; it also addresses labor, economic, liability, and accessibility issues of self-service in U.S. applications.

Acknowledgement:
NTIS
PB 80 132285

RRIS 23 305918
UMTA-VA-06-0049-79-5
DOT-UT-80047

Mouzet, J., and F. Torjussen, "Rationalisation of Fare Collection: Scope and Limitations," 43rd International Congress, Helsinki, 1979, vol. 5(a), pp. 1-51, prepared by the International Commission of Transport Economics. Brussels: International Union of Public Transport, 1979. Tabs., Figs., Photos., Apps.

This paper outlines the history of automatic fare collection, then reports on a survey of 103 transit undertakings. The questionnaires to which the 103 responded covered general information on fare collection, such as modes of payment and changes in fare systems, as well as specifics of automatic fare collection. The automatic fare collection specifics include: techniques, constraints, consequences for staff and passengers, and economic repercussions. The paper concludes with aims, future prospects, and key factors in automation. The appendixes provide detailed information tables and individual information on various undertakings.

23 PASSENGER OPERATIONS/FARES AND REVENUE COLLECTION

Strickland, Lester R., Self-Service Fare Collection: Functional Specifications, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Government Printing Office, 1980 (Report date - November 1979). 72 pp., Tabs., Figs., Refs.

Self-service fare collection (SSFC), used very successfully in Europe, is a fare collection system that makes the passenger responsible for establishing and paying the correct fare. To demonstrate potential advantages of self-service fare collection in the United States, the Office of Service and Methods Demonstrations, Urban Mass Transportation Administration, has decided to implement a SSFC demonstration at several U.S. Transit properties.

This specification provides the general guidelines for the functional, environmental, and performance requirements for SSFC hardware that would be required for a successful SSFC operation.

Acknowledgement: UMTA-VA-06-0049-79-6
NTIS MTR-79W00373

_____, Self-Service Fare Collection, Vol. II: Survey of European Transit Properties, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, August 1979. 183 pp., Tabs., Figs., Photos., Refs., Apps.

Interest in the European system of fare collection for urban transit broadly known as Self-Service Fare Collection (SSFC) has been growing in the U.S. The European experience indicates that SSFC promotes greater operating efficiency and improved service delivery. The common features of SSFC--self-monitoring, fare payment, receipts, ticket inspection and penalties--represent substantial departures from the current operating procedures and existing legal powers of U.S. transit systems. This 4-volume study, sponsored by the Urban Mass Transportation Administration, discusses the European SSFC system and the relative merits of the alternative approaches to self-service with respect to their application in the United States.

Volume I of this study describes the European approach to and rationale for self-service fare

collection; documents the experience European transit systems have had with using and enforcing these procedures; and discusses the relative merits of the alternative approaches to self-service with respect to their application in the United States. Volume II summarizes the information obtained from eleven European transit properties and one Canadian property. Volume III describes the equipment commonly used to support self-service operations in Europe and discusses the policy and design options which are presented during the selection and specification of equipment for self-service operations. Volume IV summarizes the legal issues of self-service operations in the U.S. transit environment; it also addresses labor, economic, liability, and accessibility issues of self-service in U.S. applications.

Acknowledgement: UMTA-VA-06-0049-79-3
NTIS MTR-79W00087 02 Rev.1
PB 80 132269

Sulek, Joan Dain, Self-Service Fare Collection: System Requirements, prepared by The MITRE Corporation, Metrek Division for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Government Printing Office, 1980 (Report date - November 1979). 44 pp., Tabs.

This document highlights and discusses the critical, non-hardware requirements for self-service fare collection and provides guidelines outlining the actions, procedures, policies and arrangements necessary to achieve a workable and efficient system. General requirements applicable across a range of specific system configurations are discussed in terms of the four major requirement areas identified--access, enforcement, information and support services. In addition, specific requirements associated with five variant SSFC system configurations are examined. These general and specific system requirements have been developed as a part of and, are intended to support, the on-going study and demostration of self-service fare collection sponsored by the Office of Service and Methods Demonstration, Urban Mass Transportation Administration.

Acknowledgement: UMTA-VA-06-0049-7
NTIS MTR-79W00321

23 PASSENGER OPERATIONS/FARES AND REVENUE COLLECTION

Transportation Research Board, A Report on Light Rail Transit: Surface Operations -- see Passenger Operations/Costs.

Wood, Peter, Fare Collection for Light Rail Transit, prepared by The MITRE Corporation, Metrek Division for the National Conference on Light Rail Transit, August 28-31, 1977. 33 pp., Tabs., Refs.

The range of operating characteristics commonly found on light rail systems imposes severe requirements on fare collection facilities. Costs of fare collection range from 7 to more than 20 percent of total operating cost. A few rapid transit and commuter rail systems use automatic fare collection based on a magnetically encoded card, but in general transit companies in the United States rely on coin/token operated turnstiles for rail systems and locked fareboxes on buses and streetcars. In contrast, European systems stress the use of prepurchased tickets and passes, with automatic ticket vending and validation, either on-board or off-board the vehicle. This approach has proven to be a key element in the success of European light rail systems. Before this experience can be extrapolated to the United States, the legality, integrity, and economics of such a system must be determined through the demonstration of the system in revenue operation.

Wyse, W. J., "Tyne & Wear Metro--Fare Collection," Modern Tramway and Light Rail Transit, 43, no. 515 (November 1980), 374-80. Tabs., Photos.

Fare collection methods employed in the Tyne & Wear Metro are designed for maximum cost-efficient staffing levels. Each station is unmanned while trains only carry a single motorman. The metro system employs a simple ticketing procedure with only random inspection to prevent fraud. With this system a passenger carries a card ticket with a magnetically encoded stripe indicating zone, station number, fare and passenger category. The unmanned ticket barriers, based on Paris metro barriers,

allow platform access once a ticket has been checked for validity and then returned. The integrated Tyne & Wear system allows a traveller to use the same ticket for a journey which includes metro and bus travel. Details are given of equipment used in the fare collection system and its method of operation.

RRIS 23 325875

23 PASSENGER OPERATIONS/INTERMODAL INTEGRATION

(See also Passenger Operations/Planning/Stations and Terminals)

Cheng, Leonard, and Stan Teply, "Transit Priorities and Development of a Passive Bus Detection System in Edmonton," Traffic Engineering & Control, 20, no. 11 (November 1979), 522-25. Tab., Figs., Photos., Refs.

This article describes the development of a vehicle classification device capable of identifying buses within the traffic stream without any special on-board equipment or driver's action. The program included development of a classification algorithm and a hardware system and system testing and calibration.

"Integration Is Key to Successful Public Transport," Transport, 1, no. 3 (July 1980), 65, 67. Fig., Photos.

The potential of the Tyne and Wear Metro rail system, the first phase of which is now in operation, lies in its integration with public transport such as bus services and parking facilities, as well as its ability to attract short distance travellers. A feature of the system is the increase in number of stations from 26 to 42 compared with the former suburban rail system. The service pattern has been based on a number of standard journeys with a 10 min. headway. The metro system has been designed for future extension in three further phases. The ability of the system to negotiate 4% gradients and sharp curves will allow its penetration into areas where existing rail alignments are not sufficient. Stations are unmanned and are designed with emphasis on simplicity for ease of maintenance.

RRIS 23 323351

Krzyczkowski, Roman, and others, Integration of Transit Systems, Summary, prepared by INTERPLAN Corporation for the Urban Mass Transportation Administration. Santa Barbara, Calif.: INTERPLAN Corporation, October 1973. 77 pp., Tabs., Figs., Refs.

This summary volume contains conclusions reached in the three main volumes of the report, Integration of Transit Systems. The objective of the report is to assess the potential for interagency and intermodal

integration of transit systems in U.S. urban areas, drawing on an analysis of the successful experience of European transit systems. Paper copy also available in set of 4 reports as PB-241 269-SET.

Acknowledgement:
NTIS
PB 241273

RRIS 23 091309
UMTA-RI-06-0005
Rept. 7123-5

"Leningrad Relies Mainly on Streetcars," Urban Transit Abroad, 2, no. 1 (Spring 1979), 2. Photo.

This brief article describes Leningrad's streetcar system. Of note are a local streetcar factory and the use of a street freight car for urban goods delivery.

Sacramento Regional Transit District, Light Rail--Transit Solution for Sacramento -- see Passenger Operations/Costs.

Simkowitz, Howard J., Innovations in Urban Transportation in Europe and Their Transferability to the United States, Final Report, TSC Urban and Regional Research Series, Service and Methods Demonstration Program, prepared by the Transportation Systems Center for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, March 1980 (cover - February 1980). 280 pp., Tabs., Figs., Photos., Refs., Apps.

Many of the innovations in urban transportation currently being attempted in the United States first appeared in European cities. The purpose of this report is to summarize and assess several of these European transportation innovations and to relate them to changes occurring or contemplated in the United States. Five areas of innovation are treated specifically: central city traffic rerouting and restraint, integrated transit, HOV priority treatment, coordination of transportation and land use, and residential neighborhood traffic restraint.

In-depth case studies of five European cities chosen for their innovativeness and diversity in urban transportation and land use concepts are presented. The cities--Paris, Munich, Delft, Gothenburg and

London--represent small, medium and large cities, each with unique ideas about providing mobility and a quality environment to their citizens.

In 1979 the Organisation for Economic Cooperation and Development organized a Seminar on Urban Transport and the Environment. The results of the Seminar are summarized in several appendices.

Acknowledgement: DOT-TSC-UMTA-80-11
NTIS UMTA-MA-06-0049-80-5

Sullivan, Brian E., "Route Layout Philosophy and Service Coordination Particularly for Light Rail Transit" -- see Passenger Operations/Level of Service.

Transportation Research Board, A Report on Light Rail Transit: Surface Operations -- see Passenger Operations/Costs.

23 PASSENGER OPERATIONS/LAND USE AND DEVELOPMENT

(See also Socioeconomic Factors and Passenger Operations/Planning)

Buckley, R. J., A History of Tramways: From Horse to Rapid Transit -- see History.

Carter, Stephen A., "Joint-Development Potential for Light-Rail Systems," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 82-88. Washington, D.C.: Transportation Research Board, 1978. Tab., Refs.

In recent years, many cities have begun to question the universal application of conventional rapid transit (CRT) systems but have indicated a need for a fixed-guideway solution to their problems. During this period of technological reexamination, light-rail transit (LRT) systems are being evaluated in greater detail to determine their capacity to meet operational specifications. This paper isolates for discussion the potential of LRT systems to inspire joint-development opportunities like those that have been attributed to CRT systems. Current incentives are evaluated in terms of the similarities that exist between the development of CRT and LRT systems. LRT's operational flexibility is widely recognized. This flexibility also provides new dimensions for station-area development; the small scale (compared with CRT stations) provides opportunities for initiating development potential. The barriers to joint development for LRT systems are essentially the same as those for CRT systems. The most significant barrier to a full realization of joint-development potential is the lack of adequate private capital to realize the full opportunity of the public investment. Under the new policy directives for urban revitalization, several new financial assistance programs have been developed. The urban design action grants appear to have a significant potential for use in expanding the joint-development potential of LRT systems. Value-capture options for stimulating private investment in joint development are currently being given considerable attention in demonstrations of LRT and downtown people movers. Each rapid transit system currently under consideration must conduct an assessment of the value-capture potential as part of the requirements for federal funding. Imple-

mentation techniques are discussed in terms of development incentives and the control mechanisms that are necessary to guide development along the lines of community objectives. /Author/.

Acknowledgement: RRIS 23 301312
TRB
PB 288949

Chicago Transit Authority, Development Planning and Operations Planning Departments, Rail Transit: The Operators View. Chicago: Chicago Transit Authority, 1974. 28 pp., Tabs., Figs., Photos.

Rail transit has contributed to the development and maintenance of the vital urban core in American cities. Those that have central business district subways have retained the strength and vitality evidenced in Chicago's Dearborn Street, Philadelphia's Market Street and Manhattan's 6th Avenue. The two distinct, but closely interrelated, aspects affected by rail transit are its influence on the physical shape of the community, and its influence on the community's economy. This article is not specific to light rail.

Acknowledgement: RRIS 23 057258
Chicago Transit Authority

Kashin, Seymour, "Light Rail Transit--Past, Present or Future" -- see History.

McKay, John P., Tramways and Trolleys: The Rise of Urban Mass Transport in Europe -- see History.

Metropolitan Transit Development Board, Executive Summary of the Guideway Project EIR -- see Environmental Protection.

Simkowitz, Howard J., Innovations in Urban Transportation in Europe and Their Transferability to the United States -- see Passenger Operations/Intermodal Integration.

23 PASSENGER OPERATIONS/LAND USE AND DEVELOPMENT

Smerk, George M., "The Streetcar: Shaper of American Cities," Traffic Quarterly, 21, no. 4 (October 1967), 569-84.

This article describes the historical development of the streetcar in the United States and its subsequent demise with the advent of the automobile. It points out the reasons that this mode influenced land development and in what ways.

23 PASSENGER OPERATIONS/LEVEL OF SERVICE

(See also Passenger Operations/Marketing/Planning)

Adams, William O., "The Central Subway System of the Massachusetts Bay Transportation Authority," Traffic Quarterly, 19, no. 3 (July 1965), 443-57.

A major element of the public transportation system in Boston is the Central Subway. This subway line runs through the center of the city, with many branches to the southwest. It utilizes light rail cars which, outside the subway area, run partially on private reservations and partially on public streets. For some time it was evident that drastic changes in this system must be undertaken if it was to continue to play its role in providing public transportation service.

For the above reasons, the Transportation Planning Department of the Boston Redevelopment Authority undertook studies of the Central Subway system and of the possibilities of conversion to various types of equipment. The subject presented herein was thus prepared and presented to the MBTA for its consideration. The study is of technical interest in its own right. More importantly, it represents an example of how one public agency with a partial interest can give guidance and direction to another agency of more direct interest in a particular matter.

Boscia, Joseph F., "Operational Idiosyncrasies of a Subway-Surface System," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 103-7. Washington, D.C.: Transportation Research Board, 1978. Figs.

The objectives of this paper are to acquaint the reader with the behind-the-scenes activities that constitute the day-to-day operations of Philadelphia's subway-surface system and to pinpoint techniques and methods that new systems could adopt to avoid some of the problems SEPTA faces. The paper discusses daily operations, service interruptions, training, accident prevention, and support activities. The problems discussed are accompanied

by a discussion of the solutions adopted or those that would be adopted if there were adequate funds and local cooperation. Specific recommendations for new systems are summarized. /Author/

Acknowledgement: RRIS 23 301315
TRB
PB 288949

Buckley, R. J., A History of Tramways: From Horse to Rapid Transit -- see History.

Dawson, W. R., and P. M. Dalton, Propulsion System Performance Requirements for Guided Urban Transit Systems -- see Propulsion Systems.

GM Transportation Systems Division, Light Rail Transit Systems: A Compendium of Information on LRT Systems Located Throughout Europe and North America. Warren, Mich.: GM Transportation Systems Division, August 1975. 155 pp., Tabs., Figs., Photos.

This compendium of information on Light Rail Transit (LRT) systems operating in 23 cities throughout Europe and North America, describes types of LRT (such as tram, semi-metro, and pre-metro), vehicle types, city characteristics, and government policies relating to such systems. The systems described were predominantly radial network configurations serving center city, and mostly confined within a 5 km radius. Increasing use was noted of tunnel sections in the center city as well as pedestrian mall service. There was also extensive modal integration. The broad range of LRT fleets consist of single, articulated and trailer units. Observations are also recorded of the vehicle ability to serve both low and high level platforms, monitoring and signal prioritization, honor-type fare collection, performance, ridership, operating costs, and subsidy sources specific to each country.

RRIS 23 129608

Gray, A. Ross, "Application of Light-Rail Transit Vehicles" -- see Rail Vehicles and Components.

23 PASSENGER OPERATIONS/LEVEL OF SERVICE

Groche, G., "Light Rail: A Transport System for the Future," 43rd International Congress, Helsinki, 1979, vol. 8, prepared by the International Light Rail Commission. Brussels: International Union of Public Transport, 1979. 33 pp., Figs., Photos., Refs.

> This paper defines the various stages of light rail development and the differences between metropolitan railways and light rail. It describes light rail systems proposed or in operation in over 27 cities in Europe, North America, and Australia.

RRIS 23 309990

"Integration Is Key to Successful Public Transport" -- see Passenger Operations/Intermodal Integration.

Joyce, J., and B. J. Prigmore, "Tram to Supertram," Electronics and Power, 25, no. 3 (March 1979), 207-11. Photos., Refs.

> "Light rapid transport" is essentially an upgraded tramway: in the popular idiom it is a "supertram." Its role is between the ordinary street-running transport mode (the bus) and the fully-equipped rapid transit system (the underground).

Acknowledgement:
International Union of Railways

RRIS 23 197011

Korach, Robert S., "Operating a Light Rail System," Light Rail Transit, Special Report 161, pp. 111-14. Washington, D.C.: Transportation Research Board, 1975.

> The most important parts of a transit operation--movement and control of vehicles--are discussed. Scheduling and control of trains in a hypothetical system are described. Examples of movement and control in light rail systems in Boston, Newark, Shaker Heights, and Cleveland are given. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement:
TRB
PB 249150

RRIS 23 129817

23 PASSENGER OPERATIONS/LEVEL OF SERVICE

Krzyczkowski, Roman, and others, Integration of Transit Systems, Summary -- see Passenger Operations/Intermodal Integration.

Lenow, Martin, "A Bright Future for the LRV," MASS TRANSIT, 2, no. 6 (June 1975), 13.

This brief article describes three variations of light rail application in Philadelphia. It offers some comments on future applications.

"Light Rail Transit" -- see Rail Vehicles and Compenents.

Middleton, William D., "San Diego's Trolleys Are Ready to Roll," Railway Age, 182, no. 13 (July 13, 1981), 42-45. Tab., Photos.

This article describes the new light rail transit system in San Diego, California, including its integrated service and contract maintenance. Proposed Phase II double-tracking is also described.

Parkinson, Tom, "Edmonton Success Blazes Light Rail Trail," Railway Gazette International, 135, no. 12 (December 1979), 1104-06. Figs., Photos.

This article describes the successful operations of the Edmonton, Canada, light rail system and its proposed expansion. It also describes the Calgary, Canada, system under construction and Toronto's Scarborough line.

San Diego Transit Corporation, A Comparison Between a Light Rail System and an Articulated Bus System. San Diego, Calif.: San Diego Transit Corporation, June 1975. 19 pp., Tabs.

This report is a preliminary comparison between the County's Light Rail Proposal and the use of articulated buses. The ultimate purpose is to allow evaluation of what mode is more desirable from service and cost standpoints. The report concentrates on the South Bay corridor; however, in some instances an entire regional system is analyzed because of the unavailability of data isolating the South Bay corridor. The concept used in the articulated bus alternative presented here is to operate

articulated buses on semi-exclusive right-of-way, in a similar manner as proposed by the County for light rail vehicles.

San Diego Metropolitan Transit Development Board, European Transit System Tour--Trip Report (cover title - Guideway Planning Project: European Transit System Tour--Trip Report). San Diego, Calif.: Metropolitan Transit Development Board, December 1977. 29 pp., Tabs., Figs., Photos.

This report presents a record of the salient transit systems characteristics of each community visited (Zurich and Basel, Switzerland; Mannheim, Frankfurt, Cologne, and Dusseldorf, Germany; Amsterdam, Netherlands; and London, England), plus findings from tours of the two car manufacturing plants. The initial section of the report contains a summary which discusses some of the key findings from the tour. The following sections include individual discussions of each community visited.

Scheelhaase, K. (Klaus), "The Status of German Light-Rail Systems," Journal of Advanced Transportation, 14, no. 2 (Summer 1980), 197-211. Figs.

This article summarizes light rail activities in West Germany. It compares operation of underground and light rail systems in the following areas: area coverage, efficiency, speed, comfort, and operational, technical, and financial aspects.

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited" -- see Passenger Operations/Marketing.

Schumann, John W., "Evaluations of Operating Light-Rail Transit and Streetcar Systems in the United States," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 94-103. Washington, D.C.: Transportation Research Board, 1978. Tabs., Refs.

The goal of the research presented in this paper is to evaluate how closely each of the light-rail transit (LRT) and streetcar systems in the United States approaches the LRT concept. Both LRT and streetcar systems are evaluated because the usual pattern of development, here as in Europe, has been

for streetcar systems to be upgraded gradually to LRT standards. Of the surviving networks, several run largely on reserved rights-of-way and closely approach the LRT concept; others are clearly street-car operations that possess few true LRT characteristics. Highlighting the strengths and weaknesses of existing systems should be helpful to those planning new LRT installations. The paper also stresses two of the most important qualities of LRT systems: (a) flexibility in right-of-way location and its concomitant, the ability to improve segments of systems on an incremental basic, and (b) ability of systems constructed in a trunk-and-branches pattern to provide both line-haul and collection and distribution functions, thus giving most patrons a single-vehicle ride. /Author/

Acknowledgement: RRIS 23 301314
TRB
PB 288949

_____, "Light Rail--Its Potential Grows," Progressive Railroading, 21, no. 8 (August 1978), 23-26. Tabs., Fig., Photo.

LRT, vis-a-vis other modes, can claim extra comfort, convenience, and permanence to attract riders. It's time to take another look at this descendent of the old streetcar because it can also provide--at lower cost--an energy-saving alternative to full rapid transit.

Schwartz, Arthur, and John D. Wilkins, "Use of Railroad Rights-of-Way for Light-Rail Transit Systems" -- see Industry Structure and Company Management.

Scott, P. D., "Fort Worth's Privately Owned Subway System" -- see Passenger Operations/Marketing.

Straus, Peter, "Light-Rail Transit: Less Can Mean More," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 44-49. Washington, D.C.: Transportation Research Board, 1978. Tabs., Figs., Photos., Refs.

Perhaps the single most appealing and most useful characteristic of light-rail transit (LRT) is its

inherent flexibility. Yet engineers and planners have sometimes overlooked the opportunities that accrue from this flexibility and have tried to use LRT to create a system as much like conventional rapid transit as possible at less than rapid transit's cost. This paper explores LRT's flexibility to operate in a conventional rapid transit environment, as well as its ability to not operate in a rapid transit environment. LRT is also at home in contexts more typical of the bus mode. This provides for a broad range of designs between these two extremes and allows optimal design choices to be accommodated. Design options considered in this paper include right-of-way -way treatment, approaches to fare collection, grade and curvature alignments, high- versus low-level platforms, signal and vehicle-protection requirements, and trade-offs between speed and capacity. /Author/

Acknowledgement: RRIS 23 301306
TRB
PB 288949

Sullivan, Brian E., "Route Layout Philosophy and Service Coordination Particularly for Light Rail Transit," Light Rail Transit, Special Report 161, pp. 26-36. Washington, D.C.: Transportation Research Board, 1975. Tab., Fig., Refs.

Peak-period and all-day service in public transportation are discussed with emplasis on light rail transit. Peak period service treats each line as a separate entity operating from residential neighborhoods directly to the central business district. This type of service is typified by the American metro-mode motor-bus concept. Each route in an all-day service interacts with every other route enabling regionwide mobility. This integrated approach is found throughout Europe and is also well developed in a few U.S. and Canadian cities. Traditional network arrangements, such as radial and grid setups, and more recent concepts, such as the timed transfer focal point, are considered. Detailed aspects of service integration including schedules, passenger facilities, information, and fares are reviewed. That a widespread disinclination in North America to implement integrated systems exists because of limited funds and management disinterest is

noted. The organizational structure successfully adopted in Europe to bring about service integration is described. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn. 23-25 June 1975.

Acknowledgement: RRIS 23 129809
TRB
PB 249150

Taylor, Stewart F., "Light Rail Transit Awaits Green Light," Consulting Engineer, 50, no. 3 (March 1978), pp. 73-77. Photos.

Some background, typical examples and current programs of the light rapid rail transit systems' concept are discussed.

Acknowledgement: RRIS 23 180333
EI

Tennyson, E. L., "Public Considerations of the Economics and Marketing of Light Rail Transit" -- see Passenger Operations/ Marketing.

Vuchic, Vukan R., "Place of Light Rail Transit in the Family of Transit Modes," Light Rail Transit, Special Report 161, pp. 62-76. Washington, D.C.: Transportation Research Board, 1975. Tab., Figs., Refs.

The paper attempts to clarify concepts and terminology of urban transit systems. Modes are defined by type of right-of-way, system technology, and type of service and operation. Right-of-way is shown to be the most important single feature determining mode performance and cost. Advantages of partial or full separation of transit from surface traffic are defined. The basic features of system technology are analyzed. Guided systems are compared with driver-steered systems; rail systems are compared with automated systems. With respect to operations, it is pointed out that commuter transit should be a supplement to, not a substitute for, regular transit. An analysis of optimal vehicle size shows

that, for guided systems that are in use or may be operational in the near future, minimum vehicle capacity should be 40 to 50 spaces. Based on this analysis of mode components, it appears that potential light rail applications are in medium-sized cities as carriers serving major routes and in large cities as a supplement to rapid transit. In large cities with low densities, light rail transit or light rapid transit (fully grade-separated light rail transit) also has potential for application. Small cities and special services may sometimes also use this mode. The following rights-of-way are best suited for light rail street and highway medians, railroad rights-of-way, aerial structures, and, in downtown areas, short tunnel sections. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn. 23-25 June 1975.

Acknowledgement: RRIS 23 129812
TRB
PB 249150

Wilbur Smith and Associates, San Francisco Muni Transportation Project: Planning, Operations, Marketing, Draft Final Report, prepared for the San Francisco Municipal Railway. San Francisco: Wilbur Smith and Associates, June 30, 1977. 279 pp., Tabs., Figs., Photos., Refs.

This study was authorized to develop a series of operational and service improvements to complement San Francisco Muni's capital acquisition program. It covers the existing transit system and service levels, the travel patterns and transit usage, an evaluation of the existing services, development and evaluation of alternative plans, and the recommendation of a transit improvement plan.

23 PASSENGER OPERATIONS/MARKETING

(See also Passenger Operations/Level of Service/Planning)

Andersen, Gary H., and others, Transit Marketing Management Handbook: User Information Aids, prepared by Ilium Associates, Inc., for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, November 1975. 174 pp., Figs., Photos., Refs.

This report is presented in seven parts. It first covers the identification of the community perspective and the creation and use of conceptual objectives. It then defines a systems approach to user information aids. Part IV addresses working with the elements, modules, and components of user information aids in great detail. Part V is on communication channels. Part VI describes the total system, including community profile, inventory, subsystems, costs, scheduling, implementation, and the system image. The final part is a research summary, photographic documentation, and a bibliography.

Bakker, J. J., ed., Edmonton's North East Light Rail Rapid Transit Line: Case History Conference Proceedings -- see Passenger Operations/Planning.

International Union of Public Transport, International Congress, Montreal 1977: Proceedings -- see Passenger Operations/Planning.

Jessiman, William A., and George A. Kocur, "Attracting Light Rail Transit Ridership" -- see Passenger Operations/Planning.

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited," ASCE Engineering Issues, Journal of Professional Activities, 104, no. EI2 (April 1978), 107-13. Photos.

Civil engineer transit planners can find valuable lessons in the successful operation of a trolley subway by a department store in Fort Worth, Texas. Qualities of ingenuity, economy, efficiency, and craftsmanship could have application also in big city transit.

Acknowledgement: RRIS 23 178146
EI

23 PASSENGER OPERATIONS/MARKETING

Scott, P. D., "Fort Worth's Privately Owned Subway System," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 88-91. Washington, D.C.: Transportation Research Board, 1978.

For the past 14 years a small subway system has been carrying passengers into and out of the central business district (CBD) of Fort Worth, Texas. It has two unique features: It is privately owned, and passengers ride it for free. In the early 1960s, two merchants in Fort Worth hit on the idea of providing subway service to their downtown department store from a large parking lot on the banks of the nearby Trinity River. They bought second-hand electric trolley cars from Capitol Transit Company of Washington, D.C., modified them extensively, dug a tunnel from the edge of the parking lot to the lower level of their store, and began operating the subway in February 1963. Tandy Corporation bought the department store in 1967 and continued to operate the subway, which carried nearly 15,000 passengers/d. Tandy is now rebuilding the subway cars to give them a squared-off configuration and many refinements. Introduction of these refurbished cars will coincide with the opening of Tandy Center--an eight-block complex of office buildings and shopping malls in downtown Fort Worth that the subway system will serve. There has been some preliminary exploration of the feasibility of extending the subway system several blocks south through the CBD. This short-haul do-it-yourself subway system has proved that shoppers and downtown workers can be induced to leave their automobiles in a fringe parking lot and ride into the heart of the city by light-rail transit. /Author/

Acknowledgement: RRIS 23 301313
TRB
PB 288949

Tennyson, E. L., "Public Considerations of the Economics and Marketing of Light Rail Transit," Light Rail Transit, Special Report 161, pp. 167-72. Washington, D.C.: Transportation Research Board, 1975.

The term light rail transit is defined for its use in this paper. This paper is concerned with that type of rail transit that permits electric operation

of rail vehicles, singly or in trains, and is capable of subway, elevated, at-grade, and in-street operation on any given route. Economics and marketing are related in the same manner that revenue and expense are related. Adaptation of the service to maximize public response cost will confer public benefits to both the user and the taxpayer when more costly alternatives are relieved or avoided. The unique aspects of light rail transit in developing and conferring benefits are reviewed and analyzed. Light rail transit is often less costly and more convenient than full-scale rapid transit; it is often more efficient, attractive, and economical than conventional bus transit within its proper area of operation. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129823
TRB
PB 249150

23 PASSENGER OPERATIONS/PLANNING

(See also Government Policy, Planning, and Regulation; Passenger Operations/Level of Service/Marketing; and specific topics)

Armour, Audrey, and Reg Lang, Impacts of Urban Railways -- see Socioeconomic Factors.

Bakker, J. J., ed., Edmonton's North East Light Rail Rapid Transit Line: Case History Conference Proceedings. n.p.: The Faculty of Extension, The University of Alberta, June 1978. v.p., Tabs., Figs., Photos.

The 14 papers, along with introduction and summary, constitute the proceedings of a conference on light rail transit as installed in Alberta's capital city. Five papers deal with tunnels and other civil engineering works; other papers treat signaling, station architecture, electrification, training, security, marketing and an overview of the project.

Acknowledgement: RRIS 23 188344
The University of Alberta

_____, "Light Rail Transit and Bus Integration in Edmonton," (Abridgement), Transit Development, Transportation Research Record 719, pp. 45-47. Washington, D.C.: Transportation Research Board, 1979. Figs., Refs.

This paper discusses the appropriateness of light rail transit (LRT) and bus integration as a public transportation option in Edmonton. Three transportation options were considered: a northeast freeway option that would require 70 buses during peak periods, including express services for the corridor; an all-bus option that would require use of 150 buses during peak periods, including express services through the central area of the city; and an integrated bus-LRT option that would require 75 buses during peak periods to serve mainly as feeders and cross-city services, together with 14 LRT cars on the northeast line. An integrated option means that the LRT line is part of the transit network but uses a different technology. It was concluded that the LRT-bus system has proved able to handle the existing transit patronage and has attracted additional riders, notwithstanding the introduction of transfers. The conversion from express buses to feeder buses-LRT has been accepted as an attractive alternative. The integrated system has also shown

its worth during special events at the Coliseum, Exhibition grounds, and Stadium; however, a system capable of carrying 5,400 people an hour in one direction cannot be expected to fill a stadium of 46,000 people. The disadvantage of the LRT system is that it does not serve two major trip destinations--the government center and the university--without a second transfer. A fully valid solution probably requires a more complete system.

Acknowledgement: RRIS 23 303953
TRB

Bei, Rino, "San Francisco's Muni Metro, A Light-Rail Transit System," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 18-23. Washington, D.C.: Transportation Research Board, 1978. Figs.

This paper describes improvements that are being made in San Francisco's light-rail (streetcar) transit system, the Muni Metro. The new dual-level Market Street subway accommodates Muni on the upper level and the Bay Area Rapid Transit System on the lower level. The new articulated light-rail vehicles, designed to serve the needs of both San Francisco and Boston, are described. In order to provide facilities for storage and maintenance of these vehicles, a new rail center is being constructed. The design of this facility was a particular challenge because of constraints imposed by the small size of the urban site used. Virtually all surface tracks in the city are being replaced. Muni had hoped to develop special transit rights-of-way in conjunction with the rerailing projects but encountered a political snag in the process. The power supply system that provides Muni's electrical power is unique, and the facilities it uses are also being upgraded. Finally, several route extensions contemplated by Muni are described. The new Muni Metro system is scheduled to be in full operation in late 1979. /Author/

Acknowledgement: RRIS 23 301301
TRB
PB 288949

Bottoms, Glen D., "LRT Making Tracks in North America," MASS TRANSIT, 7, no. 6 (June 1980), 8-9, 48-52, 56.

23 PASSENGER OPERATIONS/PLANNING

This article briefly describes light rail transit systems proposed or in operation in Portland (Oregon), Cleveland, Buffalo, Pittsburgh, Newark, Sacramento, Denver, Boston, Detroit, San Jose, New York City, Philadelphia, Edmonton, Calgary, Toronto, and Vancouver.

California Department of Transportation, Evaluation of the County of San Diego Report: Light Rail Alternatives, San Diego Region, prepared for James R. Mills, President Pro Tempore, California State Senate, in response to letter request for Caltrans evaluation, dated December 23, 1974. Sacramento, Calif.: California Department of Transportation, March 1975. 39 pp., Tabs., Figs., Refs., Apps.

This report was prepared at Senator Mills' request for evaluation of the planning and technical assumptions underlying the physical deployment of the system proposed by the County of San Diego. It is confined to the South Bay Corridor. The report is divided into four sections: description of proposals, system performance and service, impact assessment, and capital cost.

_____, Division of Mass Transportation, Light Rail and Alternate Transportation Uses of the San Ramon Branch Line, DMT-023. Sacramento, Calif.: California Department of Transportation, July 1977. 74 pp., Tabs., Figs., Apps.

This report reviews the many alternate transportation uses of Southern Pacific's San Ramon Branch Line (Contra Costa/Alameda Counties, California) corridor as proposed by agencies within the region. It does not analyze the merits of the proposals. It covers present use of right-of-way, alternate transportation uses, and joint occupancy. The appendixes include right-of-way width adjustments and a light rail feasibility study by Carl R. Englund, Jr. The latter report includes trackage inspection, marketing, and construction and operations.

Carter, Stephen A., "Joint-Development Potential for Light-Rail Systems" -- see Passenger Operations/Land Use and Development.

23 PASSENGER OPERATIONS/PLANNING

Citizens Transit Design Committee and Howard R. Ross Associates, Light Rail Transit System for Pitkin County: Community Criteria and Recommendations for Final Design (cover title - Light Rail Transit: Community Criteria for Final Design). Aspen, Colo.: Citizens Transit Design Committee, July 30, 1975. 267 pp., Tabs., Figs., Photos., Refs., Apps., Glossary.

The report defines the issues implicit in the light rail transit system proposed for Aspen, Colorado. It develops criteria and recommendations for final design. It describes the system and the background for its proposal. The report addresses the issues raised regarding the system, including alignment, rolling stock, land use, aesthetics, and local financing options. The alternatives are reevaluated and capital and operating costs analyzed. The appendixes include minority reports, memoranda and correspondence, and technical data and computer printout.

De Leuw Cather, Banfield Transitway Project Downtown Circulation Alternatives. Multnomah County, Ore., June, 1977. 105 pp.

Downtown Portland, Oregon, is the main destination and terminus of the Banfield corridor, as well as the focal point for existing Tri-Met bus operations and possible future light rail corridors. Downtown is also the principal commercial and employment center in the region. De Leuw Cather conducted a transit circulation study comparing bus and light rail alternatives and their impacts on downtown activities.

Demoro, Harre W., "Muni Inaugurates First Pre-Metro in U.S.," MASS TRANSIT, 7, no. 6 (June 1980), 32-33, 54-55.

This article describes the new San Francisco Muni pre-metro (light rail) transit system. It outlines Muni's historical background and details the BART/Muni development since 1960. The report covers the new light rail vehicles and automatic fare collection.

Diamant, E. S., and others, Light Rail Transit: (A) State of the Art Review, Final Report, prepared by De Leuw, Cather &

Company for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, 1976. 312 pp., Tabs., Figs., Photos., Refs., App. Also available, an Executive Summary of 75 pp.

Operational experience in cities of Western Europe and North America suggests that light rail is a viable transit alternative for U.S. cities as well. This state-of-the-art review seeks to establish a common level of understanding of light rail transit among planners, community leaders and decision makers. Contemporary planning concepts of light rail are reviewed and a description is provided of guideways, stations, hardware, operations and costs. The report examines the developmental trends of the last two decades which caused the revival of light rail in some western countries. The review focuses on the range of transit services offered by light rail, the utilization of a range of right-of-way opportunities along its routes, the lower investments and the potential for staged deployment associated with this mode.

Acknowledgement:
NTIS
PB 256821

RRIS 23 143927
UMTA-IT-06-0103-76-1
DOT-UT-50009

Ellsworth, Kenneth G., "Transit: SEPTA Shows the Way," Railway Age, 176, no. 5 (March 10, 1975), 40-42, 46. Fig., Photo.

The Southeastern Pennsylvania Transportation Authority has acquired and has been integrating the various private and public mass transit facilities serving the Philadelphia metropolitan area. This article is essentially an interview with SEPTA Chairman J. C. McConnon with much additional information incorporated in the text and accompanying illustrations and boxes.

RRIS 23 084943

Englund, Carl R., Jr., and Son, Southern Pacific San Ramon Branch Light Rail Feasibility Study, Final Report, prepared for the California Department of Transportation, Division of Mass Transportation. See California Department of Transportation, Light Rail and Alternate Transportation Uses of the San Ramon Branch Line, Passenger Operations/Planning.

23 PASSENGER OPERATIONS/PLANNING

Finn, Nicholas, and John Morrall, "A Evaluation of Intermediate-Capacity Transit Technology," Traffic Engineering and Control, 15, no. 15 (July 1974), i-v. Tabs., Fig., Refs.

In recent times considerable effort has been made to develop and apply new or existing transit technology to provide capacity in the 6,000 to 20,000 persons per hour per direction range. Technologies in this range have been termed intermediate-capacity transit systems (ICTS) and include such systems as light rail transit, personal rapid transit, light guideway transit, etc. Typically these systems cost approximately one-third to one-half that of heavy rapid transit on a per-mile basis. The purpose of this paper is to provide a framework in which ICTS can be evaluated for a given city.

Acknowledgement:
British Railways

RRIS 23 083929

Fox, Gerald D., "Network Planning for Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 54-61. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

A common problem in the approach to light-rail transit (LRT) planning is the development and testing of less than optimal networks. This problem arises from an incomplete understanding of the application of the mode and of the opportunities inherent in its application. This paper describes how unique characteristics of LRT can be exploited by developing networks to make better use of the mode. Guidelines for network development are described and illustrated by examples. A distinction is made between techniques applicable specifically to LRT and those applicable to other transit modes. The concept of tuning a network (to match the level of investment to patronage and other benefits on a segment-by-segment basis) is presented, together with a discussion of the advantages of retaining as many future options as possible in long-range transit planning. /Author/

Acknowledgement:
TRB
PB 288949

RRIS 23 301308

23 PASSENGER OPERATIONS/PLANNING

_____, An Overview of European Light Rail Development and Its Significance in North America, American Society of Mechanical Engineers Conference Paper P&P-26, 1976. 8 pp., Tab.

The paper discusses the development of transit planning concepts in Europe as they relate to light rail systems, and shows how these concepts are intertwined with the parallel development of technology and operating techniques. Of particular interest are those areas in which a consensus appears to have developed, such as in the design of vehicles and the treatment of grade crossings and intersections. In the past few years two forms of light rail are becoming discernable. These are typified by the high performance, high investment systems, and by a recent variation which seeks to achieve comparable performance by a low impact, low investment approach, relying heavily on exclusive transit lanes and signal pre-emption. Presented at the 4th Annual Intersociety Conference on Transportation, Los Angeles, California, July 18-23, 1976.

Acknowledgement: RRIS 23 148264
EI

_____, "Some Aesthetic Considerations in Light Rail Design," Planning and Design of Rapid Transit Facilities, Transportation Research Record 662, pp. 17-22. Washington, D.C.: Transportation Research Board, 1978. Figs., Photos., Refs.

Concern over the visual impacts of LRT remains one of the obstacles to a more general acceptance of the mode. Nor is this concern unjustified; for often, in the past, once a project had been approved, scant attention was paid by transit engineers to the appearance of LRT overhead and trackway. Yet all the fixed elements of LRT, trackway, overhead, and stations, are amenable to visual improvement if some of the principles of visual design, widely used in other fields, are applied. This paper outlines and illustrates some of the concepts that lie behind the installation of visually satisfactory and operationally functional LRT facilities, and suggests that closer coordination is needed between technical specialists and urban designers. /Author/

Acknowledgement: RRIS 23 178745
TRB

23 PASSENGER OPERATIONS/PLANNING

Goldsack, Paul J., "Rail Transit Construction Around the World," Transportation (Netherlands), 9, no. 1 (March 1980), 83-92.

The author describes current rail transit projects in different cities of Europe, Asia and South America.

RRIS 23 322040

Griffiths, John R., and Lester A. Hoel, "Planning Procedures for Transit-Station Renovation" -- see Passenger Operations/ Stations and Terminals.

Hardy, Theodore C., "Light-Rail Transit in Pittsburgh," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 38-42. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

The $228 million Early Action Program conceived by the Port Authority of Allegheny County in 1969 and funded by the local, state, and federal governments in 1970 was intended to end the seemingly endless series of biennial transit studies and begin the construction of a countywide rapid transit system on an incremental basis. It was to use various technologies, including existing trolleys, exclusive busways in the east and south, and the Transit Expressway (Skybus)--rubber-tired computer-controlled vehicles tied to an exclusive guideway--in the South Hills sector. Perhaps no rapid transit effort, especially the Transit Expressway element, has undergone as close public and technical scrutiny as has the Early Action Program. The inability to implement the program expeditiously resulted in the Urban Mass Transportation Administration's suspension of further action in the South Hills sector in October 1974. In 1975, key representatives of local and state governments as well as the Port Authority began working together to break the deadlocked argument about a fixed-guideway transit system for the South Hills corridor. An independent consultant was selected to perform the final alternatives analysis. When the South Hills alternatives analysis was completed and the recommendation of light-rail transit (LRT) technology was accepted in March 1976, a community consensus had been achieved. As a result,

the Port Authority amended the Early Action Program to substitute LRT for the rubber-tired vehicles on the Transit Expressway and is proceeding with engineering and environmental impact studies with the objective of having the first stage of the LRT system operational in the South Hills sector by the early 1980s. /Author/

Acknowledgement: RRIS 23 301305
TRB
PB 288949

_____, "Light Rail Transit in Pittsburgh, Pa.," Transportation Engineering Journal of ASCE, 194, no. TE4 (July 1978), 499-507. Figs.

This paper is a review of rapid transit planning and implementation in Pittsburgh with major emphasis upon the Port Authority's Early Action Program South Hills fixed guideway element. As the result of waning community consensus for proceeding with the rubber-tired "Skybus," the Urban Mass Transportation Administration (UMTA) suspended further implementation in October, 1974. In 1975, key representatives of the local and state governments as well as the Port Authority formed a Special Task Force to break the deadlocked fixed guideway transit technology issue by selecting an independent consultant to perform a final alternative analysis study. With the completion of the South Hills Alternative Analysis and acceptance of the Light Rail Transit (LRT) technology recommendations in March, 1976, a community consensus was achieved which has resulted in the implementation of engineering and environmental impact studies with the objective of having the Stage I-LRT System operational in the South Hills sector early in the 1980s.

Acknowledgement: RRIS 23 182571
EI

Hebert, Ray, "San Diego's Tia Juana Trolley," MASS TRANSIT, 7, no. 6 (June 1980), 14-16.

This article describes San Diego's light rail project including historical background, operating plans, and construction program.

23 PASSENGER OPERATIONS/PLANNING

Hupp, R. Craig, and Donald N. Weisstuch, "Analysis of Transit Alternatives," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 74-82. Washington, D.C.: Transportation Research Board, 1978. Tabs., Figs., Photos., Ref.

The planning and implementation of major public works projects require the consideration of many engineering, social, environmental, political, and fiscal issues. In particular, the 1970s have seen nonengineering issues take precedence over engineering considerations in project planning and implementation. These issues are highlighted in a conceptual approach based on six tests of feasibility--physical, operational, institutional, social and environmental, financial, and economic feasibility. This paper describes the application of this approach and the nonengineering issues that were identified as having an effect on the planning of a light-rail transit system in Harrisburg, Pennsylvania. The feasibility tests were found to constitute a valuable approach because they lead to a formal or explicit recognition of several planning issues that are usually only implicitly recognized in planning studies. Once they were explicitly identified, these issues could be analyzed in terms of their impact on the planning process. /Author/

Acknowledgement:
TRB
PB 288949

RRIS 23 301311

Institute of Transportation Engineers, Technical Council Committee 5C-5, "Light-Rail Transit in North America: What's Going On?" ITE Journal, 50, no. 3 (March 1980), 31-37. Tabs., Fig., Photo., Refs.

An ITE informational report by Technical Council Committee 5C-5 organized to develop design guidelines for handling light-rail transit (LRT)-vehicular traffic situation is presented.

RRIS 23 322834

Jackson, Russell E., "Kawasaki Trams Help Rejuvenate Philadelphia's Light Rail Lines," Railway Gazette International, 136, no. 9 (September 1980), 790-92. Figs., Photos.

23 PASSENGER OPERATIONS/PLANNING

The first of 141 trams built in Japan was delivered to Septa on July 29, marking an important stage in the modernisation of America's most complex and diverse light rail network serving the west side of Philadelphia. To house and service these trams a new 120-car storage yard is being created, and a heavy programme of track and signalling renewal is in hand.

Jensen, Jack L., and Ronald G. Rude, "Governmental and Public Constraints to the Implementation of Light-Rail Transit in Dayton, Ohio," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 68-74. Washington, D.C.: Transportation Research Board, 1978.

This paper discusses the local, state, and federal governmental and institutional constraints to the implementation of light-rail transit. The experiences of the Dayton region are used in an attempt to draw broadbased conclusions and general recommendations applicable to other medium-sized urban areas. The planning process that led to the selection of the light-rail mode in Dayton is also described. /Authors/

Acknowledgement: RRIS 23 301310
TRB
PB 288949

Jessiman, William A., and George A. Kocur, "Attracting Light Rail Transit Ridership," Light Rail Transit, Special Report 161, pp. 126-46. Washington, D.C.: Transportation Research Board, 1975. Tabs., Figs., Refs.

This paper addresses the complex planning considerations for attracting ridership to transit systems, particularly light rail transit systems. Taking the viewpoint of a potential rider, the authors present some observations that lay the foundation for understanding ridership response. Users are not interested in technology per se but in the level of service the system provides. Level of service is a complex combination of many system attributes such as travel time, cost, comfort, and convenience. Different user groups (market segments) make different trade-offs among these attributes. They assign different relative weights or importance to each attribute. To attract maximum ridership, the

system should be tailored to the particular needs and constraints of the market segments it is serving. No single system is superior for all market segments. The paper discusses the various level-of-service attributes and their relative importance to different market segments based on empirical evidence and attitude surveys. Although one cannot generalize because different market segments assign different relative weights to level-of-service attributes, the following rank ordering of attributes from most influential to least influential is most typically the case: out-of-vehicle travel time, in-vehicle travel time, cost, comfort, and safety. For work trips travel time reliability should be added as either the first or second most important attribute. The characteristic convenience is dismissed from this list as being too broad to be specifically and universally defined. The paper goes on to introduce disaggregate, behavioral, travel-demand models as an emerging analytical technique that the transit planner can use to more precisely address the problem of the ridership response of different market segments to different level-of-service packages. Examples of these models are then used to demonstrate how different prototypical households would respond to various technologies under various representative operating policies. Some conclusions are drawn on the situations in which light rail transit would appear to be the most attractive form of public transportation from the rider's point of view, and some suggestions are made on how to improve attraction of light rail transit ridership. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129820
TRB
PB 249150

Kizzia, Tom, "Light Rail: Where the Action is," Railway Age, 181, no. 18 (September 29, 1980), 40-46. Fig., Photos.

This article emphasizes the flexibility of the light rail concept by comparing the adaptations developed or being developed in different North American cities. Among the systems discussed are Buffalo, Pittsburgh, Portland (Oregon), and Edmonton.

23 PASSENGER OPERATIONS/PLANNING

Knight, Kenneth G., "Buffalo's Light-Rail Rapid Transit System," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 32-38. Washington, D.C.: Transportation Research Board, 1978. Tab., Figs.

The 1976 agreement in principle by the Urban Mass Transportation Administration (UMTA) to participate in the financing of Buffalo's $336 million light-rail rapid transit (LRRT) project was the culmination of almost 10 years of planning by the Niagara Frontier Transportation Authority and the western New York community for an integrated bus and rail rapid transit system. At least 5 more years of design development and construction lie ahead. This agreement also marked the end of a lengthy, and often frustrating, alternatives analysis process that helped to guide UMTA's development of federal policy on major urban mass transit investments. Buffalo will be the first U.S. city to have a completely new rail transit project that features the advantages of light-rail technology. This paper describes the LRRT project and reports on the results of the alternatives analysis process. Comparative cost-effectiveness statistics for various transit alternatives are included in the paper. The current phase of project development (general architecture and engineering) is described, and a schedule is given for the completion of the system. /Author/

Acknowledgement: RRIS 23 301304
TRB
PB 288949

Kompfner, P., Notes on Light Rail Transit in Great Britain, Supplementary Report 482. Crowthorne, England: Transport and Road Research Laboratory. 38 pp., Tabs., Figs., Photos., Refs., Apps.

This report combines a broad review of the state-of-the-art in modern light rail transit (LRT) systems with a survey of the potential for their introduction in the larger British cities. Following a short history of Britain's earlier tramways, an account is given of the latest techniques and technologies, with an example in the Tyne and Wear Metro. A look at costs shows that in favourable circumstances the savings in operating cost compared with urban buses can help to offset the much greater initial capital cost of an urban light railway.

Recent experience in western Europe demonstrates this operational saving, and shows that LRT can also be more attractive to passengers than buses. Although several studies of possible LRT systems have been made recently in Britain, a survey of planners and transport operators in eleven large cities showed their preference for electric buses--battery or trolley--should oil become prohibitively expensive. There are comparatively few cities where LRT could be installed without physical difficulty or uneconomic expense. Even so, LRT could be economically attractive in several cities now because of its potential to lower operating costs. Recommendations are made for further study. (a)

Acknowledgement:
TRRL

RRIS 23 309928

Kudlick, Walter, and R. David Minister, "Effect of Varying Light-Rail Design Standards," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 49-54. Washington, D.C.: Transportation Research Board, 1978. Tabs., Refs.

Light-rail transit (LRT) is a flexible transit mode that can be implemented in a variety of ways. This complicates the task of comparing it with other modes when carrying out the alternatives analysis required by the Urban Mass Transportation Administration to secure federal funding for fixed-guideway transit projects. A recent study for Santa Clara County, California, dealt with this problem by evaluating four possible variations in LRT design standards. This paper draws on the results of that study. It features a description of the study area and site conditions, a definition of the four LRT design standards considered, analysis of the different capital costs associated with each design standard, a discussion of the range of estimates of expected patronage, and a review of the resulting operating requirements and costs. The paper then presents a detailed comparison of the cumulative impact of these design differences on the cost-effectiveness measures for the bus alternatives that were also analyzed in the Santa Clara County study. It was found that, while capital cost for LRT can vary significantly according to the assumed design standard, the cost-effectiveness is primarily dependent on other factors. It is therefore concluded that alternatives analysis requires the study of only one LRT design standard to establish the

relative advantages and disadvantages of transit mode alternatives for a given metropolitan area. /Authors/

Acknowledgement: RRIS 23 301307
TRB
PB 288949

Kuyt, W. C., and J. D. Hemstock, "Calgary's Light-Rail Transit System," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 27-32. Washington, D.C.: Transportation Research Board, 1978. Tabs., Figs., Refs.

This paper describes some of the background to the development of the South Corridor light-rail transit (LRT) line in Calgary. Characteristics of the city, the corridor, and the existing transit system are also presented. The results of a recent study undertaken to determine the type and timing of transit improvements are briefly summarized. Alternatives studied in detail included LRT, busways, and exclusive bus lanes: LRT was selected and implementation has begun. Finally, the paper describes the vehicles and route chosen.

Acknowledgement: RRIS 23 301303
TRB
PB 288949

Landgraf, Robert J., "Pre-Metro: Conversion Now or Never," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 62-67. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

This paper develops as a case study the 60-year experience of a light-rail transit system that was conceived as a pre-metro line with the option for eventual conversion to full metro or semi-metro status. It describes the metro features originally included and the added facilities aimed toward upgrading to metro. It explains the opportunities for full conversion that were passed by and the conflicts between incompatible regional rapid transit plans and competing rail technologies. The accumulation of factors both physical and political that

finally arrested the development of this light-rail operation are laid out step by step. Forces and counterforces that acted on this system as the wider community worked slowly toward regionalization of transit are described. Special attention is given to those local community concerns that finally closed the door to metro conversion when at last the opportunity and funding to convert seemed to be available. Guidelines are developed for planners, designers, and civic and transit leaders. /Author/

Acknowledgement: RRIS 23 301309
TRB
PB 288949

Lehner, Friedrich, "Light Rail and Rapid Transit," Light Rail Transit, Special Report 161, pp. 37-49. Washington, D.C.: Transportation Research Board, 1975. Tabs., Refs.

Light rail transit can be considered as an advanced form of the conventional streetcar. Its tracks lie primarily on separated rights-of-way. In areas where there is heavy congestion, they are often in tunnels. Like rapid transit, which is independent from surface traffic on its entire length, light rail transit with modern vehicles can undertake the role of the primary transit carrier in medium and large urban areas, supplemented by and coordinated with a secondary feeder system. The most common application of light rail is in medium-sized cities. Rapid transit serves large cities. With respect to its service quality, capacity, productivity, and efficiency, rapid transit is superior to light rail transit in various degrees. However, a particularly important advantage of light rail transit is that its network can be constructed with lower investment costs and in a shorter period of time than can a rapid transit network. Moreover, individual sections can be used immediately after completion. When light rail transit has underground sections in central urban areas, it can be a transitional system to later rapid transit as long as adequate alignment standards are applied in construction. The requirement for an integration of transportation and urban design is particularly important for light rail and rapid transit. Their radial lines from the central cities should form the axes of residential corridors. Thus they perform 2 roles. To the corridor residents and commuters from the region, through park-and-ride,

they represent an attractive alternative to the private automobile; at the same time, they reduce traffic loads on urban arterials and streets. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129810
TRB
PB 249150

Lenow, Martin, "The Resurgence of Light Rail Transit," Transportation Engineering Journal of ASCE, 102, no. TE2 (May 1976), 229-42. Tabs., Figs., Photos., Refs.

With the development of a new Standard Light Rail Vehicle there has been an increased interest in light rail systems for community mass transit. Light Rail Transit systems can be tailored to the needs of communities having too many passengers for successful busing and too few for an elaborate metro system. Existing systems, ranging from street running lines to private right-of-way cars, illustrate the diverse roles possible. Among many uses for the intermediate capacity light rail systems are: off loading subways; feeding and cross-connecting area to subways, light car service for initial use on lines expected to grow to metro status; supporting special products such as entertainment centers.

Acknowledgement: RRIS 23 139490
EI

Leonard, Gerald B., "Issues in the Implementation of Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 12-15. Washington, D.C.: Transportation Research Board, 1978.

A conference on light-rail transit (LRT) invariably seems to draw out a highly explicit discussion about car design, the existence of rights-of-way for construction, and the great disparities between European advances and those in the United States. This paper suggests that, despite the high degree of competence that the technical community can claim in advocating LRT implementation, it is all little more than an academic exercise if the local, state, and

national political realities are not recognized as integral aspects of implementation. The discussion in this paper is based on a survey conducted on a national scale of the key political figures in those states or areas considering LRT, as well as many key members of the agency and consulting staffs. The paper calls attention to the essential weaknesses inherent in current efforts to revitalize LRT as a primary element in urban transportation. /Author/

Acknowledgement: RRIS 23 301300
TRB
PB 288949

MacDonald, D. L., and J. J. Bakker, "Edmonton's Northeast Light-Rail Rapid Transit Line," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 23-27. Washington, D.C.: Transportation Research Board, 1978. Fig., Photo.

Edmonton's light-rail transit (LRT) line has a total length of 7.2 km, 1.6 km of which is in subway. The line goes from the central business district (CBD) to the northeast sector of the city and uses the Canadian National Railways right-of-way. The project was approved at $65 million and is currently below estimates as well as ahead of schedule. The LRT line is the result of a balanced transportation plan that was finally adopted in 1974 to serve a city of nearly 500,000. The subway portion has two underground stations with full mezzanine floors. The mezzanine floors are part of an overall pedestrian system and connect with the basements of adjacent buildings. The subway was built to accommodate the largest standard subway car. The equipment specifications for the 14 articulated cars were based on performance and proven reliability. The construction methods used caused a minimum of interference in the CBD. Since relatively small portions were let successively, local contractors were able to use proven techniques to handle the work on a fixed-price basis. Despite the severe inflation of 1975 and 1976, costs were kept within reasonable limits. The proposed service will provide 5-min headways in the peak hour, giving a capacity of 5000 passengers/h. At midday the headway will be 10 min. The LRT line will be fully integrated with the bus transit system, and timed transfers will be provided between bus and rail. The LRT line in Edmonton makes use of available opportunities and provides the least expensive solution to the trans-

portation problems of the northeast sector and its rapid residential development. /Authors/

Acknowledgement:
TRB
PB 288949

RRIS 23 301302

Metropolitan Transit Development Board, Executive Summary of the Guideway Project EIR -- see Environmental Protection.

_____, San Diego Light Rail Transit Project, Status as of April 1979. San Diego, Calif.: Metropolitan Transit Development Board, April 1979. 38 pp., Tab., Figs., Photos., Refs.

This report describes the (then) proposed San Diego light rail transit project. It covers route characteristics, operating plan, and access. It also outlines the financial and development program including estimated costs.

Miller, Vance E., Jr., Conceptual Design of a Light Rail Transit System for South Lake Tahoe, Technical Memorandum (Draft), prepared by Howard R. Ross Associates for the California Tahoe Regional Planning Agency. Menlo Park, Calif.: Howard R. Ross Associates, August 14, 1978, revised September 5, 1978. 54 pp., Tabs., Figs., Photos., Refs.

This report develops a conceptual design for a light rail system for South Lake Tahoe. System location and configuration alternatives are analyzed. Estimated costs and system performance are detailed. Major design choices are described, including an intermodal waterborne terminal location. Light rail vehicle characteristics, including aesthetics, are discussed. A new technology of transferring power to a vehicle from a roadway or fixed guideway by inductive coupling is explained.

Morris, William H., "Comparison of Busway and Light Rail Modes," Light Rail Transit, Special Report 161, pp. 50-61. Washington, D.C.: Transportation Research Board, 1975. Tabs., Figs., Refs.

Much has been offered to convince decision makers that busways are the least costly of fixed-guideway services in medium-density urban corridors. Until recently, these claims could be questioned but not

refuted because a thorough analysis of comparable busway and light rail transit (LRT) systems did not exist. However, such a work was completed in late 1974. The Rochester, New York, Charlotte-Henrietta corridor studies are a detailed busway-versus-LRT mode comparison for a specific corridor. The studies show that, although LRT and busway investment costs are similar for equal facilities, LRT exhibits substantial operating costs, operation, and service advantages. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129811
TRB
PB 249150

Myers, Edward T., "The Virtue of Light Rail," MR: Modern Railroads Rail Transit, 33, no. 7 (July 1978), 58-61. Figs., Photo.

This article illustrates the advantages of light rail transit through discussion of the Toronto Transit Commission's new Scarborough light rail line. The Canadian light rail vehicle's technical features are presented, including the energy savings yielded over the traditional PCC car.

Norley, K. T., Light Rail Application and Design: Report on Overseas Travel. Adelaide, Australia: South Australia Director-General of Transport, December 1979. 220 pp., Figs., Photos., Refs., App.

The purpose of the report is to document an investigation of overseas Light Rail practice undertaken as part of the Preliminary Design of the Adelaide Northeast Light Rail Project. The report combines a broad appreciation of the application of Light Rail and other public transport modes in selected cities, with the investigation of design and other details of specific relevance to the Northeast project and other potential applications of Light Rail technology in Adelaide.

Acknowledgement:
NTIS
PB 81 124620

23 PASSENGER OPERATIONS/PLANNING

O'Brien, W., J. Schnablegger, and S. Teply, "Control of Light-Rail Transit Operations in Edmonton," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 115-19. Washington, D.C.: Transportation Research Board, 1978. Figs., Photo., Refs.

The first line of Edmonton's light-rail transit (LRT) system is currently being completed. The underground portion of the line in the downtown area connects to a surface portion that shares its corridor with a major railway line. Interactions between the railway, LRT, and other transportation modes have created problems in the areas of safety, roadway capacity, and regularity of service. This paper describes the approach taken in Edmonton to overcome these problems. The new transportation management system, which is in its initial stages of implementation, is a major tool in minimizing the negative impacts of LRT. The system focuses on the establishment of LRT controls that, in addition to the categoric requirements of safety, must guarantee optimum use of the LRT tunnel, which in turn depends greatly on the regularity of service on surface portions of the LRT line, and integration with other transportation modes in terms of safety, coordination of scheduling between LRT and buses, and minimization of disruption to all modes at the nine grade crossings. In general, the flexibility of LRT operations and the implementation of an integrated transportation management system has enabled cost-effective solutions to be developed. /Author/

Acknowledgement: RRIS 23 301317
TRB
PB 288949

Orski, C. Kenneth, "The Urban Mass Transportation Administration View of Light Rail Transit," Light Rail Transit, Special Report 161, pp. 14-15. Washington, D.C.: Transportation Research Board, 1975.

This paper addresses the issues of how the Urban Mass Transportation Administration views light rail transit, what future role UMTA sees for this technology in American cities, and what considerations lead UMTA to sponsor a Light Rail Transit Conference. Although UMTA recognizes the virtues of the light rail concept, it does not see this as a panacea for urban mobility problems. It is believed that light rail may be a major solution to the

search for less costly, more efficient and more environmentally attractive transportation systems that can economically serve the dispersed land use and travel patterns of metropolitan areas. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129806
TRB
PB 249150

Paaswell, R. E., and others, An Analysis of Joint Development Projects (Final Report on First Year Tasks) -- see Socioeconomic Factors.

Parkinson, Tom E., "Light Rail Transit System Evaluation," Light Rail Transit, Special Report 161, pp. 159-66. Washington, D.C.: Transportation Research Board, 1975. Tabs.

Evaluation of a light rail transit system involves many considerations that are specific to sites or systems and cannot be treated in a general study. However, it is possible to establish a value for reductions in running time relative to reductions in direct operating cost, savings in passenger time, and increases in net system revenue. These values, which depend on passenger volume, can be related to capital cost improvements. These include eliminating on-street running, eliminating grade crossings, instituting high-platform loading, and varying fare-collection systems. Brief comments are included on other factors of system evaluation including reliability, safety, and provision for future growth. The paper concludes that, although certain intensive improvements are likely to be justifiable, these must depend on a more detailed system-specific evaluation. In general, it suggests that the planning and design of light rail transit should keep the system as simple as possible and, on the surface, avoid automatic application of rapid transit or railroad standards and costs. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129822
TRB
PB 249150

23 PASSENGER OPERATIONS/PLANNING

Parsons Brinckerhoff/Louis T. Klauder and Associates, Pre-Design Summary Report, prepared for Tri-Met in cooperation with the Oregon Department of Transportation. Multnomah County, Ore., October 1980. 107 pp.

This report is a summary of technical studies on the Banfield Light Rail Project. The report is the result of the pre-design phase of the Banfield Light Rail Project from November 1979 to July 1980.

Poulton, M. C., ed., Light Rail Transit in Vancouver--Costs, Potential and Alternatives, a report by students of the School of Community and Regional Planning, University of British Columbia. Vancouver, Canada: The Center for Transportation Studies, University of British Columbia, 1980. 151 pp., Tabs., Figs., Refs.

While some indicate that Light Rail Transit is the easy answer to the transit problems of major metropolitan areas, some urban transit experts are far from convinced. This study raises a number of important questions--questions which should be addressed by policy makers in any city before they undertake a major expenditure for urban transit.

RRIS 23 316753

Rogers, Lee H., "Evolution of Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 4-8. Washington, D.C.: Transportation Research Board, 1978. Ref.

Social, economic, and governmental needs frequently dictate changes in the use of urban transport technology. It is the evolution of public belief and policy that most influences the development of any technology. Overdependence on petroleum fuels for transport and industrial growth has cast doubt on long-term options for continued urban life-styles and mobility. There is a need now for planning and deployment of new light-rail transit (LRT) systems. LRT, like all forms of transport, must be judged on its benefits and social costs to both users and non-users. A look at Ghent, Hanover, Mannheim, Zurich, and Utrecht can show the transit planner how five cities have developed and used their LRT services in

a manner that provides greater accessiblity for all citizens as well as less direct pollution and easier adaptability to the existing urban setting. The technology of LRT is simple when innovative planning and engineering are used. /Author/

Acknowledgement: RRIS 23 301298
TRB
PB 288949

_____, "Light Rail Transit: 1975 Usage and Development," Light Rail Transit, Special Report 161, pp. 7-13. Washington, D.C.: Transportation Research Board, 1975. Tab., Ref.

A worldwide survey of light rail transit systems and specific details of many of these operations are included. General principles of the application of light rail technology are derived from some of these applications. The author notes that the design and subsystem components for the guideway, as well as the power distribution technology exist presently. The vehicle necessary to implement this technology is currently in design or is being manufactured in Belgium, Germany, Switzerland, Canada and the U.S. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129805
TRB
PB 249150

Ross, H. R., W. R. Hamilton, and A. E. Bamesberger, Light Rail Transit System for the Portland Region: System Description, Technical Data and Costs of the Regional System, Summary Report, prepared by Howard R. Ross Associates for Tri-County Metropolitan Transportation District. Palo Alto, Calif.: Howard R. Ross Associates, March 15, 1978. 33 pp., Tabs., Figs., Photos., Refs.

This is a design report on the light rail transit system developed for the Portland (Oregon) region between July 1976 and December 1977. It describes the various Banfield corridor alternatives and the systemwide facilities, e.g., vehicles, fixed facilities, electrification. The proposed regional light rail system is also described.

23 PASSENGER OPERATIONS/PLANNING

San Diego County, Public Works Agency, Department of Transportation, Light Rail Alternatives for San Diego Region. San Diego, Calif.: San Diego County Department of Transportation, December 19, 1974. 66 pp., Tabs., Figs., Photos., Refs.

This report presents the light rail alternatives proposed for the San Diego (California) region. It is divided into eight chapters (Introduction, Summary, Scope of Study, Physical Feasibility and System Description, Cost Summaries and Comparison, Legal Considerations, Evaluation of Routes, and Rail Transit Terminology) and a section of light rail photographs. The report is limited to a review of light rail alternatives compared to a rapid rail system. Alternatives for only one corridor (Centre City San Diego to Tijuana) are considered.

_____, Light Rail Alternatives for San Diego Region: Appendix. San Diego, Calif.: San Diego County Department of Transportation, December 19, 1974. 49 pp., Tabs., Figs.

This appendix consists of five distinct parts: Overview of South Bay Corridor, CPO Transit Program, Centre City Transit System, Corridor Design Considerations, General Features of Routes, and Correspondence with Railroads. The section entitled "CPO Transit Program" describes the different combinations of land use and transportation options tested to develop the regional comprehensive plan for the year 1995. "Centre City Transit System" outlines the proposed 1995 Centre City transportation system. A detailed description of some features of routes which are not described in Chapter 4 of the main volume are found in "General Features of Routes".

"San Diego Light Rail: On Track for '81," Railway Age, 181, no. 11 (June 9, 1980), 34-38. Fig., Photos.

Metropolitan Transit Development Board is meeting its 30-month schedule for converting a 14-mile segment of former freight-only San Diego and Arizona Eastern Railway into a light-rail transit line reaching the Mexican border. Methods of acquiring SD&AE, funding the project without UMTA participation, construction details, operations planning and estimates of potential traffic are detailed.

23 PASSENGER OPERATIONS/PLANNING

MTDB owns entire 115-mile railroad and is resuming freight service to the East over this mountainous region.

RRIS 23 315016

San Diego Metropolitan Transit Development Board Staff, Guideway Planning Project, Executive Summary and Staff Recommendations, Final Report. San Diego, Calif.: San Diego Metropolitan Transit Development Board, June 1978. 24 pp., Tabs., Figs., Photos.

This report is a concise presentation of the present (1978) status and proposed development of San Diego's light rail guideway project. Costs and available resources are discussed, and corridor performance and regional alternatives are analyzed. A special analysis of possible acquisition and joint use of the San Diego and Arizona Eastern Railway is included.

Schuchardt, J. Andrew, James E. Pierson, and R. David Minister, Description of Alternatives: Guadalupe Corridor Alternatives Analysis (cover title - Guadalupe Corridor, Phase II, Alternatives Analysis/D.E.I.S., Description of Alternatives, Working Paper for Discussion Purposes), Working Paper No. 1, prepared by Wilbur Smith and Associates; Bechtel, Inc.; Earth Metrics, Inc.; Jordan/Avent & Associates; Mark Thomas & Co., Inc.; and Sedway-Cooke for Santa Clara County Transit District. n.p.: Wilbur Smith and Associates, January 1980. 171 pp., Tabs., Figs., Photos.

This report describes the various transportation alternatives proposed for the Guadalupe Corridor in Santa Clara County, California. It consists of eight chapters: Introduction and Overview, The Guadalupe Corridor, The Guadalupe Corridor Alternatives Analysis, Basic Design Parameters, Transit Vehicles, Detailed Description of Alternatives, General Operating Assumptions, and Closing Statements. Two of the proposed alternatives include light rail. As the title indicates, this is a working paper to present the alternatives for further discussion and evaluation.

Schumann, John W., Northeast Sacramento Light Rail Transit Project: Preferred Alternative Report (cover title - Preferred Alternative Report: Sacramento North East Corridor), coopera-

ting agencies--Sacramento Area Council of Governments, Caltrans, City and County of Sacramento, and Regional Transit. Sacramento, Calif.: Sacramento Area Council of Governments, June 1981. 56 pp., Tabs., Figs.

This report summarizes the transit alternatives analysis results of a study conducted in the Sacramento region. It also documents the local decision process.

Simpson & Curtin; Urban Engineers, Inc.; and Wallace, McHarg, Roberts & Todd; Market Street West Transportation Study, Final Report, prepared for the City of Philadelphia, Department of Public Property and the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, March 1978. v.p., Tabs., Figs., App.

The study investigated current transit service and usage patterns. Results revealed the need for improved transit access west of 18th Street. Several alternative transit improvement proposals were developed to meet this need. After a two-stage analysis of the various transit proposals, the Study concluded that a new rapid transit station should be built to serve Market Street West on the Market/ Frankford Line between the existing stations at 15th and 30th Streets. Various improvements to the subway-surface system, which is the only rail line that now penetrates the portion of the Study Area west of 18th Street, were also recommended.

Acknowledgement:
NTIS
PB 298751

RRIS 23 199002
UMTA-IT-09-0050-79-1

Straus, Peter, "Light Rail Rebirth: San Francisco Also Has Muni," Progressive Railroading, 21, no. 8 (August 1978), 28-32, Tab., Fig., Photos.

This article relates the history of transit in San Francisco culminating in the planning and design of BART and the modernization of Muni's light rail system. It describes the difficulties encountered and discusses the standardization of light rail vehicles.

23 PASSENGER OPERATIONS/PLANNING

Sullivan, Brian E., "Light Rail Transit in Canada," Transportation (Netherlands), 9, no. 1 (March 1980), 75-82. Refs.

This paper describes current light rail transit planning and operation in Canada's major cities and smaller communities. There are ten urban areas in Canada with 250,000 or more people. Two of these have light rail systems in operation, three have lines under construction and nine others are planning LRT systems.

RRIS 23 322039

Taber, John, and Jerome Lutin, "Investigating the Potential for Street Operation of Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 161-66. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

This paper examines the potential for light-rail transit (LRT) operations in the street with mixed traffic. It is hypothesized that street operation of LRT is possible, and in some areas desirable, for both cost reduction and service improvement. It is believed that the potential cost savings in construction should lead planners to consider using LRT in streets. However, little work has been done in analyzing the problems associated with street operation. This paper attempts to establish a systematic framework for investigating the potential for a shared street environment and to stimulate a discussion among LRT Planners about the role of street operations in proposed systems. The methodology used in this study has two phases: the identification and investigation of the associated problems and the analysis of various design elements and strategies. Several possibilities for street operation are discussed and the generic problems of street running and traffic conflicts are analyzed. The approach is based on existing data from Toronto. /Author/

Acknowledgement:
TRB
PB 288949

RRIS 23 301324

Taylor, Stewart F., "Another Alternative: The Case for Light Rail, Part I," Transit Journal, 1, no. 2 (May 1975), 15-34. Figs., Refs.

23 PASSENGER OPERATIONS/PLANNING

The objective of providing better mass transit through conventional means (bus, heavy rail transit and personal rapid transit) are examined, and the possibilities of increasing system efficiency by incorporating light rail rapid transit into the overall plan is explored. A discussion of the physical characteristics of light rail covers aspects of the vehicle, the operator, fare collection, design criteria and standardization, right-of-way, stations, controls and communication. Light rail's basic characteristic is versatility, and it can be used effectively in: basic service supplemented by bus; supplement to high capacity rapid transit; rapid transit feeder service; high-speed suburban service; and short haul intercity service. Light rail's capability to meet fluctuating traffic demand is discussed and comments are made on light rail as an instrument for integrated public transportation.

RRIS 23 099307

_____, "Another Alternative: The Case for Light Rail, Part II," Transit Journal, 1, no. 3 (August 1975), 45-63. Tabs., Figs., Refs., App.

This article explores the cost factors and the planning and development of light rail and includes a worldwide survey of light rail technology.

RRIS 23 131317

_____, "Introduction: Light-Rail Transit: Planning and Technology," Light-Rail Transit: Planning and Technology, Special Report 182, p. 1. Washington, D.C.: Transportation Research Board, 1978. Ref.

The conference papers were presented in 5 sessions. The opening session relates accounts of light rail transit (LRT) successes in many cities. Problems and issues that have frustrated significant LRT development in the U.S. are explored in subsequent papers. A series of case studies examine where and how progress has been achieved. The basic dichotomy between socioeconomic and technological issues in the implementation of LRT is reflected in papers on such topics as network planning, joint development opportunities, and the formulation of functional

specifications and fare collection, traffic engineering and power supply. The final session examines the future in the light of past experience. The session papers emphasize the overriding need to inform decision makers at all levels about the characteristics of LRT. Ignorance and bias must be removed before LRT can move forward on a broad front.

Acknowledgement:
TRB
PB 288949

RRIS 23 301329

_____, "Light Rail Transit in the United States," Transportation (Netherlands), 9, no. 1 (March 1980), 67-74.

The paper reviews recent LRT developments in four American cities, two of which have undertaken to rehabilitate and upgrade their existing surface street railway systems, and the other two have embarked upon construction of entirely new light rail systems.

RRIS 23 322038

_____, "The Rapid Tramway: A Feasible Solution to the Urban Transportation Problem," Traffic Quarterly, 24, no. 4 (October 1970), 513-29. Tab., Photos.

This article discusses the rapid tramway, or light rail transit system as it is known in the U.S. It presents the advantages of such a system, the major of which are lower capital cost than conventional full rapid transit subways and better service than buses. The rapid tramway generally runs in subway only in the CBD, and runs on median or other reserved right-of-way in the remainder of the distance. Specific examples are given of five European systems.

RRIS 23 057870

_____, Urban Transportation--Another Alternative: A World-Wide Survey of Light Rail Technology, Public Policy Studies No. 10. Washington, D.C.: The Heritage Foundation, 1975. 63 pp., Tabs., Figs., Refs.

23 PASSENGER OPERATIONS/PLANNING

Light Rail Transit is intermediate between bus transit and full subway rapid transit. Light Rail Transit has higher capacity and speed than bus, and lower capital cost than full subway rapid transit. This report surveys the use of Light Rail Transit around the world, compares Light Rail Transit to both bus transit and full subway rapid transit, and highlights the advantages of Light Rail Transit.

RRIS 23 083084

Tennyson, E. L., "Rationale for Selection of Light Rail Transit for Pittsburgh's South Hills," Rail Transit Planning and Rail Stations, Transportation Research Record 760, pp. 18-25. Washington, D.C.: Transportation Research Board, 1980. Tabs., Figs., Refs.

A project to update the 70-year-old South Hills electric railway system in Allegheny County, Pennsylvania, was among the first such projects to be subjected to intense scrutiny as part of a federally mandated alternatives analysis. The rationale of the accepted solution is examined, and the technical process by which consensus was achieved is described. The data used derive from the alternatives-analysis work of the consultants, from regional planning projections, and from the author's observations and experience in the area. The alternatives analysis did not include a final solution for the downtown Pittsburgh traffic problem, but the subsequent review process, based on good data, led to the conception and acceptance of the Sixth Avenue subway.

Acknowledgement:
TRB

Thompson, Gordon J., "Light Rail Transit Social Costs and Benefits" -- see Socioeconomic Factors.

Tomazinis, Anthony R., "Europe's Light Rail Hybrids Hold Lesson for U.S.," Urban Transportation Abroad, Special Supplement, Fall 1980. 8 pp., Fig., Photos.

This special supplement is devoted to light rail in Europe. Among the areas considered are technology, adaptations, coordination between land development and metro lines, and innovative institutions. Why

there is so much metro construction in Europe, achievements, impacts, and concerns are all discussed.

Transportation Research Board, This Is Light Rail Transit, prepared by the TRB Committee on Light Rail Transit for the National Conference on Light Rail Transit, Philadelphia, Penn., 23-25 June 1975. Washington, D.C.: Transportation Research Board, June 1975. 16 pp., Photos.

This illustrated brochure was prepared for distribution at the National Conference on Light Rail Transit in Philadelphia. Its short illustrated sections discuss: What is Light Rail Transit, Guideway, The Vehicles, Stations, Operations, Cost, and Development. Light rail is proposed as a less expensive alternative to costly full-scale rapid transit, or as an intermediate stage to such transit.

Acknowledgement: RRIS 23 097296
TRB

_____, This Is Light Rail Transit, prepared by the TRB Committee on Light Rail Transit for the National Conference on Light Rail Transit, Boston, Mass., 28-31 August 1977. Washington, D.C.: Transportation Research Board, August 1977. 16 pp., Photos.

This illustrated brochure was prepared for distribution at the National Conference on Light Rail Transit in Boston. Its short illustrated sections discuss: What Is Light Rail Transit, Right-of-Way, Vehicles, Stations, Operations, Cost, Development, Advantages.

Acknowledgement: RRIS 23 185220
TRB

_____, Urban Transportation Alternatives: Evolution of Federal Policy, Special Report 177. Washington, D.C.: Transportation Research Board, 1977. 38 pp., Tabs., Figs., Refs.

The findings are presented of two successful conferences which formed the foundation of a unique process of federal rule-making, and the underlying process that culminated in the conferences is dis-

cussed. The availability of new funds for urban mass transportation in 1974 raised complex questions of equitable resource allocation. Reaching answers to these questions involved the developing of consensus on a series of compromise solutions that would best reconcile the competing demands of different claimants. The first conference in February 1975 reached agreement on five principles which dealt with regional multimodal strategy, incremental planning, managing of the existing system, framework for evaluation, and public involvement. A number of related issues were discussed at both conferences. Documents prepared by UMTA as background to the conferences are discussed.

Report of conferences held February 23-26, 1975 at Airlie House, Warrenton, Virginia, and March 29-April 1, 1976 Hunt Valley, Maryland, and sponsored by the Urban Mass Transportation Administration, U.S. Department of Transportation.

Acknowledgement: RRIS 23 165384
TRB

Transportation Systems Center, Light Rail Transit: State-Of-The-Art Overview, Technology Sharing, Final Report. Washington, D.C.: U.S. Department of Transportation, May 1977. 82 pp., Tabs., Figs., Photos., Refs., Apps.

This document presents an overview of light rail transit, an urban transit alternative which has the potential to help fill the need for flexibility in public transportation. Existing and proposed U.S. and Canadian light rail transit systems are described with a historical perspective. The technical components and service characteristics of this mode are analyzed. The document also deals with a number of planning and implementation issues, including economics of operation, and various environmental and social concerns.

Acknowledgement: RRIS 23 304761
NTIS DOT-TSC-OST-79-4
PB 80 103641

Van Witsen, Ir. M., Report of the Thirty-Eighth Round Table on Transport Economics Held in Paris on 24th-25th March, 1977 on the Following Topic: Scope for the Use of Certain Old-Established Urban Transport Techniques: Trams and Trolley-Buses, Monograph No. 38. Paris: European Conference of Ministers, 1978. 73 pp., Tabs., Figs., Refs.

23 PASSENGER OPERATIONS/PLANNING

The author mentions the criteria to be fulfilled by public transport: compatibility with urban planning, basic social, environmental, accessibility and economic needs, short travel time and level of service, and describes the characteristics of some conventional transport technologies (taxi, bus, express bus, tram, express tram, underground and urban railway) of interest to the user, operator and the community. An attempt is made to show the possibility of using express trams in towns with a population of 100,000 to 2,000,000. Details are given of possible network designs and of peak hour traffic along the main transport routes. Some technological developments concerning the infrastructure, route layout, safety and control, traffic and priority rules, and rolling stock are cited. The operational aspects of standard tram routes, e.g., regularity, frequency and capacity, fare collection, and information are discussed together with their organisation. Cost-benefit analyses form the basis of the selection of a transport system for a given situation.

Acknowledgement: TRRL

RRIS 23 182836

Vigrass, J. William, "Physical, Operational, and Performance Characteristics of the Light Rail Mode," Light Rail Transit, Special Report 161, pp. 19-25. Washington, D.C.: Transportation Research Board, 1975. Refs.

An overview of the light rail mode is presented. General characteristics and application of the mode are described, emphasizing the versatility of its guideway, the railway track. Physical characteristics of the right-of-way and ranges of dimensions for right-of-way and vehicles are discussed. Stations are discussed briefly. Basic technical simplicity of the light rail mode is pointed out as a significant virtue. Operating characteristics (both maximum running speeds and typical average operating speeds) are indicated. Acceleration of typical vehicles is noted. Frequency of service is discussed, and ranges for various traffic control systems are given. Riding quality and visual impact are pointed at as being favorable. Capacity of light rail lines is given as a few thousand to 12,000 passengers/h. In special cases, a high of 18,000 passengers/h can be achieved by using multiple-unit trains of 3 or more cars. Choices a designer has to

attain maximum capacity are stated. Capital costs of contemporary new light rail systems are given as ranges of costs for various configurations. It is concluded that light rail transit is a medium-cost mode providing a medium level of capacity at medium speeds that can find application in many corridors or areas in medium and larger sized urban areas. It is pointed out that light rail is an existing mode with proved capabilities that needs little or no new research and development. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 23 129808
TRB
PB 249150

Vuchic, Vukan R., "Current Trends: Problems and Prospects of Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 8-12. Washington, D.C.: Transportation Research Board, 1978. Ref.

The difficult task of rescuing our urban transit system from several decades of neglect has only started. Among the obstacles to transit improvements is our deeply rooted double standard for different types of expenditures. Purchase of wasteful items by consumers is considered to move the economy but the use of public funds, even for the construction of very useful projects, is often criticized as wasteful. Another serious obstacle to the development of rail transit in our country has been a lack of expertise in the planning, technology, and operation of these modes. We have virtually invented a new mode: unreliable rail transit. A concerted effort must be made to apply the technical skills that this technology requires to fully realize its great potential. A major step toward that goal would be made if the Urban Mass Transportation Administration would redirect some of its efforts from the development of exotic modes (some of which have little potential) toward the modernization of standard rail and bus technologies. In spite of these obstacles, light-rail transit (LRT) has recorded significant advances. It is now broadly recognized as a serious contender for major transit improvements in many medium-sized and large cities. Its modernization in Europe is continuing, new LRT

systems are under construction in Canada, and several U.S. cities are actively planning or designing new LRT systems. There is also a major potential for extensive deployment of LRT in the large cities of developing countries that has not been fully recognized yet. President Carter has promised to pursue three important goals: to revitalize cities, to decrease unemployment, and to increase energy efficiency; if he takes a correct path toward these goals, we should see construction of LRT in a number of our cities in the near future. /Author/

Acknowledgement: TRB
PB 288949

RRIS 23 301299

_____, Light Rail Transit Systems - A Definition and Evaluation, prepared for the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, October 1972. 128 pp., Figs., Tabs.

This report defines and evaluates light rail transit systems.

RRIS 23 043626
PB 213447 DOT-TSC-301-1

Walton, C. Michael, and others, An Evaluation of the Applicability of Light Rail Transit to Texas Cities, prepared by the Center for Transportation Research, The University of Texas at Austin for the Texas State Department of Highways and Public Transportation and the Urban Mass Transportation Administration. Austin, Tex.: The University of Texas, August 1980. 354 pp., Tabs., Figs., Photos., Refs., Apps.

In order to make impartial yet informed decisions relative to certain transportation alternatives, it is necessary to have an understanding of the characteristics and unique features as well as the opportunities of a range of options. The objective of this study was to perform an investigation of Light Rail Transit (LRT) tracing its evolution up to recent trends. The end result was to provide information of sufficient detail and scope to facilitate an assessment of the suitability of LRT as an alternative (or complement) to the bus in Texas cities.

23 PASSENGER OPERATIONS/PLANNING

This report provides a critique of the literature of LRT, both recent and past. A lengthy discussion of LRT design and operations covers vehicles, route network, track and structures, power supply, stations and platforms, fare collection, signalling and traffic control, and operations. A review of LRT suitability encompasses a look at cities with LRT, including those which have proposed and retained LRT systems; the subsequent application of a modelling analysis, assessing city and LRT characteristics, results in prediction of LRT viability.

Identification and assessment of important factors relevant to an evaluation of LRT are provided. These factors include monetary costs, land use, socioeconomic and political impacts, energy and environmental implications, and safety. A general comparison of LRT with other modes, specifically bus options and Automatic Guideway Transit, is included.

The implications of LRT for Texas cities, an historical review of urban rail transit in Texas, a discussion of current plans and proposals, and pertinent guidelines for consideration of LRT in an alternative evaluation process are discussed.

Acknowledgement:
University of Texas

Tech. Rpt. 1058-1F
Tech. Stdy.
3-10-78-1058

Williams, Aubrey J., "Developing a Light Rail Transit Mall--An Overview," Transit Journal, 6, no. 3 (Summer 1980), 23-28.

This article discusses the development of a light rail transit mall in general terms. Design objectives are outlined. Pedestrian/vehicle and transit/motor vehicle interfaces are considered. Finally, architectural treatment is discussed.

Wilson, Thomas M., "Case Study of Buffalo's Rail Transit Development," Transportation Engineering Journal of ASCE, 104, no. TE5 (September 1978), 665-76. Figs., Refs.

The history of the Buffalo, N.Y., Light Rail Rapid Transit System is presented. The 10-yr development

period includes the establishment of a regional public transportation authority, the initial planning, the alternatives analysis, and the final development of the LRRT system. Guidelines for other cities planning rail transit systems are offered from this experience. They include establishing a strong transportation authority, involving the public from the conception of the project, developing public support, organizing political leaders, being cost conscious, and emphasizing cost of delay.

Acknowledgement:
EI

RRIS 23 184641

23 PASSENGER OPERATIONS/RAIL CARS AND EQUIPMENT

(See also Rail Vehicles and Components; Signals, Control and Communication; Propulsion; and Passenger Operations/Planning)

Mills, James R., "Light Rail Transit: A Modern Renaissance," Light Rail Transit, Special Report 161, pp. 3-6. Washington, D.C.: Transportation Research Board, 1975.

The evolution of light rail transit from the earliest street railways is traced. Between the demise of the electric interurban and streetcar systems and the resurgence in urban rail transit, the concept of light rail was lost. The rediscovery is not now motivated by sentimentality, but on the inherent advantages of this technology. Rapidly increasing costs in heavy rail development and uncertainty about new transit technology served to spark the new interest. It offers the opportunity to initiate rail transit development at rather modest costs. The flexibility of light rail technology allows transit service, system capacity and available resources to be traded off in a variety of ways. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn. 23-25 June 1975.

Acknowledgement: RRIS 23 129804
TRB
PB 249150

Porter, Dennis L., "LRV Procurement Process in Portland Light Rail Car Update," APTA 1981 Rapid Transit Conference.

This document describes the highly successful two-step procurement process to purchase 26 light rail vehicles and related equipment and services for the Banfield Light Rail Project in Portland, Oregon.

23 PASSENGER OPERATIONS/STATIONS AND TERMINALS

(See also Passenger Operations/Planning)

Carter, Stephen A., "Joint-Development Potential for Light-Rail Systems" -- see Passenger Operations/Land Use and Development.

Griffiths, John R., and Lester A. Hoel, "Planning Procedures for Transit-Station Renovation," Rail Transit Planning and Rail Stations, Transportation Research Record 760, pp. 25-33. Washington, D.C.: Transportation Research Board, 1980. Tabs., Figs., Refs.

The application of planning and design procedures to the problem of transit-station renovation is described. The process is illustrated by using as an example the 69th Street Terminal in Philadelphia, a complex transit terminal that handles many transfer movements and transit vehicle connections and has a variety of system elements that are badly in need of renovation. The performance of the existing station was evaluated based on selected objectives and criteria and in light of its conformance with current policy guidelines. A series of alternative renovation layouts was produced to improve the processing of passengers by reducing conflicts, trip times, and level changes. These plans included consideration of horizontal and vertical separation, station access for fare collection, passenger volumes on each transit line, and accommodations for the disabled. Each alternative renovation plan was then evaluated along lines similar to those for the evaluation of the existing station. The results indicated the priority of each interest group and showed where conflict existed. The next step in the process is the preparation of detailed architectural and structural design plans and specifications, cost estimates, and a financial plan.

Acknowledgement:
TRB

"Integration Is Key to Successful Public Transport" -- see Passenger Operations/Intermodal Integration.

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited" -- see Passenger Operations/Marketing.

23 PASSENGER OPERATIONS/STATIONS AND TERMINALS

Straus, Peter, "Light-Rail Transit: Less Can Mean More" -- see Passenger Operations/Level of Service.

Transportation Research Board, A Report on Light Rail Transit: Surface Operations -- see Passenger Operations/Costs.

04 PROPULSION SYSTEMS

(See also Electrification, Rail Vehicles and Components, and Passenger Operations/Rail Cars and Equipment)

Dawson, W. R., and P. M. Dalton, Propulsion System Performance Requirements for Guided Urban Transit Systems, Monograph No. RR212. Downsview, Ontario, Canada: Ontario Ministry of Transportation and Communication, August 1977. 28 pp., Tabs., Figs., Refs., Glossary.

A methodology is presented for analyzing different performance levels, such as acceleration, deceleration, top speed and peak power to weight ratios, of transit vehicles. The optimization of these levels is desirable to attain certain performance objectives, including the maximization of line and station capacity and the minimization of travel time, capital costs, operating costs and energy consumption. Presented is a method which analyzes the trade-offs involved to achieve various levels of these objectives. The report describes the measures of propulsion system performance and the factors to be considered in their determination, and relates them to the design characteristics and parameters of a typical LRT system. Additional factors which may affect the selection of performance parameters are discussed, namely, the effect of curves, grades and spot speed restrictions. A set of values is recommended which could be used as design guidelines until more definitive studies can be performed on specific applications.

Acknowledgement:
TRRL

RRIS 04 197285

"Three-Phase and Simotrac Combined in Muelheim," Railway Gazette International, 135, no. 4 (April 1979), 319-20. Tab., Figs., Photo.

The prototype light rail vehicle delivered to Muelheim combines three-phase traction motors with a drive utilizing hollow axles called Simotrac and designed to save weight and space. A series of other light rail and rapid transit vehicles with three-phase motors are in service or on order for Germany and Austria.

RRIS 04 195061

04 PROPULSION SYSTEMS

Vutz, Norman, "Technology and Economics of Regeneration for Light-Rail Applications," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 149-60. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

Regeneration is one method of recycling a vehicle's surplus kinetic energy during braking. Regeneration is recuperative braking in which the recycled energy goes back to the vehicle's power supply system for use by other vehicles. Several propulsion systems that use regenerative braking have been applied and operated on direct-current electrified rail systems. The fundamental limitations on effectiveness that are beyond the propulsion designer's control are considered. The performance of an alternating-current induction motor system with an inverter and a direct-current series motor system with a chopper are explored to illustrate the present state of technology. Comparison is made with two other types of recuperative braking--flywheel energy storage and height changes in the route profile. The inefficiency of the former and the difficulty of construction of the latter are noted. The industry's present interest in regeneration is questioned since it would have minimal economic impact but require complex propulsion hardware and extra maintenance costs. /Author/

Acknowledgement: RRIS 04 301323
TRB
PB 288949

08 RAIL-HIGHWAY GRADE CROSSINGS

(See also Rail Vehicles and Components and Safety)

Fox, Gerald D., An Overview of European Light Rail Development and Its Significance in North America -- see Passenger Operations/Planning.

Groche, G., "Light Rail: A Transport System for the Future" -- see Passenger Operations/Level of Service.

Institute of Transportation Engineers, "Light-Rail Transit in North America: What's Going On?" -- see Passenger Operations/Planning.

Korve, Hans W., "Traffic Engineering for Light-Rail Transit," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 107-15. Washington, D.C.: Transportation Research Board, 1978. Figs., Photos., Refs.

The development of safe and operationally effective designs for at-grade interactions and crossings for light-rail transit (LRT) is an issue central to the future deployment of the mode. This paper describes a design approach based on the performance characteristics of light-rail vehicles (LRVs) and the application of conventional traffic engineering hardware and design practice. At-grade operation of LRT introduces potential conflicts with motor vehicles and pedestrians at intersections, in streets between intersections, and at mid-block crossings. These conflicts are a source of delay and accidents for LRVs. Application of the appropriate conflict-control techniques must consider that modern LRVs have performance characteristics essentially similar to those of transit buses. There are four strategies available to the traffic engineer to eliminate or control points of conflict among LRVs, motor vehicles, and pedestrians: at-grade separation of traffic flows in space, vertical separation of traffic flows in space, separation of traffic flows in time, and reduction in the number of traffic approaches. /Author/

Acknowledgement: RRIS 08 301316
TRB
PB 288949

08 RAIL-HIGHWAY GRADE CROSSINGS

"Light Rail Transit" (1976-77) -- see Rail Vehicles and Components.

Morag, David, "At-Grade Crossings of Light Rail Transit," (Abridgement), Rail Transit, Transportation Research Record 627, pp. 7-10. Washington, D.C.: Transportation Research Board, 1977. Tabs., Figs., Refs.

The purpose of this paper is to provide a methodology for analyzing and estimating the effect of semiexclusive LRT line on motor-vehicle traffic. Four major concerns are identified: the expected level of impact on traffic; the improvements required in terms of added lanes; and, the minimum grade separation requirements. This type of analysis may provide the transportation planner with the tool by which the grade separation requirement could be minimized, or staged to some future year for the cases in which the motor vehicle flow was estimated at the time of the analysis would exceed the capacity, the additional ROW for crossing improvement was unavailable or too costly, or totally grade-separated intersections must be considered. The results of this analysis indicate that the deployment of LRT semiexclusive lines in fringe areas is a feasible alternative to transit lines that are totally grade-separated, fixed guideways. This analysis also indicates that, for LRT systems planned for multicar operations at high service frequencies, locating transit stops at grade crossing is desirable to reduce traffic impact.

Acknowledgement: RRIS 08 167600
TRB

Schnablegger, John, and Stan Teply, "System Design for Light Rail Transit Improves Intersection Performance," ITE Journal, 48, no. 6 (June 1978), 36-39. Figs., Photos., Refs.

At-grade light rail transit crossings represent not only a safety hazard but a roadway capacity constraint as well. An analysis of the problem of traffic control at such locations was undertaken in Edmonton, Alberta. It led to the objectives which in turn resulted in the implementation of control

measures. Significant improvements have been achieved through the application of Transportation Management principles.

Transportation Research Board, A Report on Light Rail Transit: Surface Operations -- see Passenger Operations/Costs.

Volk, Helmut, "Road and Rail Crossing Computerized in Edmonton," Rural and Urban Roads, 16, no. 8 (August 1978), 40-42. Figs.

This article discusses a citywide computerized control system for street and rail traffic in Edmonton, Alberta, Canada. It outlines the design objectives and guiding principles for improving the traffic control. Finally, it describes the operation of the system.

03 RAIL VEHICLES AND COMPONENTS

(See also Propulsion Systems; Signals, Control and Communications; Passenger Operations/Planning)

Buckley, R. J., A History of Tramways: From Horse to Rapid Transit -- see History.

California Public Utilities Commission, Rules for the Design, Construction and Operation of Light Rail Transit Systems Including Streetcar Operations -- see Safety.

Carlson, S. P., and others, PCC--The Car That Fought Back, Special 64. Glendale, Calif.: Interurban Press, 1980.

This history of the development of the PCC electric street railway car during the 1930s and its refinement into the 1950s contains a significant amount of technical detail. Beginning with the 1930 street railway industry, which was in decline and lacked a modern competitive vehicle, the book traces the market study, research-and-development efforts, production, and application of the vehicle. Operators and suppliers funded the effort through the Electric Railway Presidents' Conference Committee that lent some of its initials to the car's PCC designation. All aspects of the development of the streamlined car are covered: body design, trucks and suspension, motors and drive, control systems, standardization, modularization, and light in weight to reduce first cost and operating costs. Also described are contemporary efforts to produce a vehicle competitive with the PCC, as well as application of the PCC technology to rapid transit vehicles. In conclusion, the book tells of the export of both PCC cars and PCC technology to other nations where the technology continued to evolve. PCC cars still operate in some North American cities and elsewhere around the world.

Acknowledgement:
TRB

Demoro, Harre, "The PCC Car--Still a Good Idea" -- see History.

Diamant, E. S., and others, Light Rail Transit: (A) State of the Art Review -- see Passenger Operations/Planning.

03 RAIL VEHICLES AND COMPONENTS

Downey, Paul J., User's Guide for the Interactive Scheduling Program: Preliminary Calendar Version, Operational Handbook, prepared by the Transportation Systems Center for the Urban Mass Transportation Administration. Cambridge, Mass: Transportation Systems Center, August 1978. 30 pp., Tabs.

The Office of Transportation Management of the Urban Mass Transportation Administration (UMTA), in conjunction with the Transportation Systems Center (TSC), designed and developed the Interactive Scheduling Program (ISP) to assist rail-transit operators in the scheduling of preventive maintenance. The ISP was first applied to the scheduling of warranty inspections for the new Light-Rail Vehicles (LRVs) acquired by the Massachusetts Bay Transportation Authority (MBTA). The warranty for these vehicles covers a 2-year period, and requires scheduled inspections every 45 days. While the ISP is designed for the LRVs, its scope could easily be broadened to aid any property with equipment whose maintenance is conducted on a calendar basis. This document describes the user's guide for the preliminary calendar version of an ISP. A computerized scheduling system is described that is designed to operate on a real-time or on-line basis. By utilizing a set of program commands, the user is allowed to enter and extract data relative to vehicle warranty scheduling. A scheduling algorithm was developed for this program which incorporates a variable work window whose purpose is to minimize fluctuations in the daily workload. This minimization results in less required manpower and overtime, therefore resulting in a reduced maintenance cost. The program operates on a five consecutive year span for the years between 1976 and 2000.

Acknowledgement:
NTIS
PB 295021

RRIS 03 197441
UMTA-MA-06-0074-78-1
DOT-TSC-UMTA-77-43

Gray, A. Ross, "Application of Light-Rail Transit Vehicles," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 137-41. Washington, D.C.: Transportation Research Board, 1978. Figs., Refs.

Flexibility is the primary concept associated with light-rail transit (LRT). This flexibility includes its application, implementation, operation, and capacity and has clear implications for light-rail vehicle (LRV) design, since the capabilities of a

vehicle selected for a specific system must meet the requirements of that system. The thesis of this paper is that all such LRT requirements can be met by a family of vehicle designs based on standardized subsystem componentry. System requirements are dealt with in four categories--capacity, geometry, performance, and impact; the vehicle components include the car-body alternatives; it is shown that the use of single-ended LRVs is desirable whenever system characteristics permit and that articulation is properly used to solve clearance rather than capacity problems. The Toronto Transit Commission's ordering of new LRVs is used to illustrate the process of selecting vehicle attributes that meet the system requirements and the process of moving from a definition of desirable vehicle characteristics through development and testing to car delivery. The ability to derive several vehicle designs from the basic design is discussed in the context of ongoing development activities in order to prove the feasibility of the family-of-vehicles idea. /Author/

Acknowledgement: RRIS 03 301321
TRB
PB 288949

Groche, G., "Light Rail: A Transport System for the Future" -- see Passenger Operations/Level of Service.

Hellewell, D. Scott, "Time to Standardise LRT Car Designs: Guest Commentary," Urban Transit Abroad, 2, no. 1 (Spring 1979), 4. Tab., Photo.

This article presents arguments for standardization of light rail transit vehicles. Parameters for a six-axle standard tramcar and an eight-axle LRT car are offered.

Hirshfeld, C. F. (cover - Hirschfeld, C. F.), The Electric Railway Presidents' Conference Committee Streetcar Research and Development Program: Five Technical Bulletins, 1931-1933, reprinted by the Urban Mass Transportation Administration. Washington, D.C.: U.S. Department of Transportation, February 1975. Tabs., Figs., Photos.

03 RAIL VEHICLES AND COMPONENTS

The street railway industry experienced a period of economic difficulty in the late 1920s as costs for new equipment and operating costs rapidly escalated and automobile ownership increased dramatically. Industry leaders agreed on a unique industry research and development program to develop a totally different, technologically advanced street railway car that would compete in performance characteristics with the automobile, be less expensive to purchase, and that would increase transit ridership. The research program was financed by street railway companies and commercial firms in the transit supply business. They pioneered use of rubber suspension systems, unitized all-welded steel body construction, and advanced illumination.

Acknowledgement:
NTIS
PB 239996

RRIS 03 090415
UMTA-RDD-31-75-1

Kashin, Seymour, "Light Rail Transit--Past, Present or Future" -- see History.

Lenow, Martin, "A Bright Future for the LRV" -- see Passenger Operations/Level of Service.

"Light Rail Transit," Lea Transit Compendium, 1, no. 5 (1974). 54 pp., Tabs., Figs., Photos., Refs.

This compendium charts statistics of 39 operating systems throughout the world. Vehicle data sheets are offered for 20 different light rail vehicles. These include photos, diagrams, and details of vehicle performance, dimensions, suspension, propulsion, and braking, electrical and control systems, and body specifications.

_____, Lea Transit Compendium, 2, no. 5 (1975). 176 pp., Tabs., Figs., Photos., Refs.

This compendium describes, in detail, 47 different light rail systems. Vehicle data sheets (see 1974 abstract) are included for 44 different light rail vehicles (some of which were also included in the 1974 edition).

_____, Lea Transit Compendium, 3, no. 5 (1976-77), a supplement to vol. 2, no. 5, 1975. 56 pp., Tabs., Figs., Photos., Refs.

This supplement includes descriptions of eight traffic signal pre-emption and crossing protection systems and five automatic vehicle monitoring systems. Vehicle data sheets (see 1974 abstract) are included. These are either new or revised.

McGean, T. J., and others, Cost Savings Potential of Modifications to the Standard Light Rail Vehicle Specification, Final Report, prepared by N. D. Lea & Associates, Inc., for the Transportation Systems Center and the Urban Mass Transportation Administration. Washington, D.C.: U.S. Government Printing Office, February 1979. 173 pp., Tabs., Figs., Photo., Apps.

This report describes an assessment of the Standard Light Rail Vehicle (SLRV) specification to determine whether the relaxation or modification of some requirements could result in a significant reduction in vehicle costs. A Technique of Assessment by Structured Interviewing was applied to include judgments and ideas by each facet of the industry concerning modifications to the specification which would be acceptable and could reduce car costs. A five-stage filtering process was used to select 20 cost reducing modifications from an initial list of 640 candidate specification modifications. The large list resulted from an in-depth review of the current specification. The final set of 20 areas were analyzed quantitatively to estimate cost savings that might be realized. SLRV cost savings of 16 percent are shown to result by implementing the 15 specification modifications which are termed as having acceptable impact upon mission performance. The remaining five modifications have major impact upon mission performance (e.g., unidirectional operation, doors on only one side, simplified friction brakes, no articulation, and elimination of compressed air). Cost savings of 25 percent are shown to result from specifying a bidirectional, nonarticulated car with simplified friction brakes and no compressed air and which also incorporates the 15 specification modifications with acceptable impact on mission performance.

Acknowledgement:
NTIS
PB 295070

RRIS 03 197453
UMTA-MA-06-0025
DOT-TSC-UMTA-79-9

03 RAIL VEHICLES AND COMPONENTS

McInerney, F. T., The Feasibility of Retrofitting Lifts on Commuter and Light Rail Vehicles -- see Human Factors.

Middleton, William D., "Competing for the Light-Rail Vehicle Market," Railway Age, 181, no. 18 (September 29, 1980), 56-60. Photos.

> This article describes the competition in the manufacture of light rail vehicles. Especial attention is given to the Urban Transportation Development Corporation's Canadian Light Rail Vehicle. Other suppliers offering vehicles to the market are Kawasaki Heavy Industries, Breda, Siemens-Duwag, Bombardier Limited, BN, Hawker Siddeley, M.A.N., Tokyu, SIG, and Fiat. The article describes some of the vehicles, orders proposed and contracted for, and "Buy America" problems.
>
> RRIS 03-322804

Muehlberger, R. F., Standard Light Rail Vehicle, contributed by the Intersociety Committee on Transportation for presentation at the Intersociety Conference on Transportation, Denver, Colorado, September 23-27, 1973, Paper 73-ICT-80. Tab., Figs.

> This paper summarizes the results of a joint agency cooperative effort to develop the National Standard Light Rail Vehicle for surface-subway passenger transport. Selected vehicle performance characteristics, design criteria and design features are described.

Acknowledgement:
ASME

RRIS 03 051409

Radin, Charles A., "MBTA Not Out of the Woods Yet," MASS TRANSIT, 7, no. 6 (June 1980), 10-13. Photos.

> This article describes the difficulties the Massachusetts Bay Transit Authority has had and continues to have with the Boeing light rail vehicle. Mechanical, political, and financial areas are discussed.

Railroad Research Information Service, Special Bibliography: Safety-Related Technology -- see Safety.

03 RAIL VEHICLES AND COMPONENTS

Scholtis, G., and W. Waite, "Design Trends in Light Rail Vehicles," Railway Gazette International, 134, no. 6 (June 1978), 381-83. Figs., Photos.

Because articulated trams offer a number of technical and operating advantages over single cars, their popularity is increasing. Power ratings of 10 kW/ton are now considered desirable to give 1.3 meter per second acceleration and a top speed of 80 km/h. Chopper control is more costly and heavier than switched resistances, and it can only be justified when regenerative braking raises the level of energy saved to around 30 percent.

RRIS 03 178946

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited" -- see Passenger Operations/Marketing.

Scott, P. D., "Fort Worth's Privately Owned Subway System" - see Passenger Operations/Marketing.

Silien, Joseph S., and Jeffrey G. Mora, "North American Light Rail Vehicles," Light Rail Transit, Special Report 161, pp. 93-98. Washington, D.C.: Transportation Research Board, 1975. Fig., Refs.

This paper presents the evolution of North American light rail vehicles from the 1920s to the present. Emphasis is placed on conditions of the electric street railway industry in the 1920s, attempts of car standardization, and movement toward a radically new, high-performance car as background to the development of the Presidents' Conference Committee car of the 1930s. Events leading to the new standard light rail vehicle are presented along with its significant dimensional specifications and performance characteristics. The proposed Canadian light rail vehicle is described. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement:
TRB
PB 249150

RRIS 03 131927

03 RAIL VEHICLES AND COMPONENTS

"Time to Standardize LRT Car Designs," Railway Gazette International, 133, no. 5 (May 1977), 180-85. Tabs., Photos.

Despite the existence of only a small number of builders of specialized cars for light rail transit systems, no standard car has emerged suitable for the two basic types of LRT operation in the way that the American PCC design of the 1930s became widely accepted on both sides of the Atlantic. The author compares, contrasts and comments on 16 basic designs in use or proposed for Western Europe and the U.S., and suggests standards covering a six-axle car suitable for straight tramway networks and an eight-axle design with greater capacity for pre-metros.

RRIS 03 156873

Von Rohr, Joachim, "Foreign Light Rail Vehicle Development," Light Rail Transit, Special Report 161, pp. 99-110. Washington, D.C.: Transportation Research Board, 1975. Tab., Figs., Photos., Refs.

This paper begins with a brief description of how the light rail mode has been developed in several West European countries, especially in the Federal Republic of Germany. The basic features of the light rail vehicle and how the vehicle was derived from the streetcar and the subway or heavy rapid transit car are explained. Finally, the various attempts at standardization of light rail vehicles in West Germany after World War II are discussed. Several modern light rail vehicles are described, and it is explained why standardization could only be partially achieved. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement:
TRB
PB 249150

RRIS 03 129816

00 RIGHT-OF-WAY

(See also Economics, Track and Structures, and Passenger Operations/Costs/Level of Service/Planning)

Billing, J. R., and H. N. Grouni, "Design of Elevated Guideway Structures for Light Rail Transit," (Abridgement), Rail Transit, Transportation Research Record 627, pp. 17-21. Washington, D.C.: Transportation Research Board, 1977. Figs., Photo., Ref. Discussion by Vukan R. Vuchic.

This paper outlines a rationale for designing an elevated guideway for urban rail transit, and applies this to a design of a double-track guideway for a proposed light rail transit (LRT) line. Three factors that affect the rationale for designing elevated guideway structures for LRT include performance requirements that specify guideway function; constraints that limit the choices available to the designer; and, design considerations that tell the designer how to choose among options, all of which satisfy the performance requirements and constraints. A design study is included which develops a suitable guideway configuration and examines in some detail a typical four-span structure. The following design aspects are discussed: vehicle specifications; guideway cross sections; structural design; construction options; and, costs. The authors conclude that the rationale presented for the design of elevated guideway structures for LRT is neither a specification nor a code, but should form the basis for either. It identifies performance requirements that must be met for the structure, constraints that limit the designer's range of choice in meeting the performance requirements, and design considerations that provide the basis for making design choices.

Acknowledgement: TRB

RRIS 00 167603

Fox, Gerald D., "The Design of Light-Rail Track in Pavement," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 130-36. Washington, D.C.: Transportation Research Board, 1978. Figs., Photos., Refs.

Many existing light-rail transit (LRT) networks and parts of some new ones require the construction of track in pavement. Sometimes this track is intended for joint use with street traffic or buses; in other places paved track is used in pedestrian areas or on medians. This paper describes the types of LRT

track used in pavement in North America and Europe and suggests that the standards now in use in the United States may be in need of revision. There has been very little construction of LRT track in pavement in North America in the last 40 years. What little has been built has followed the traditional standards of the industry, which date from the earliest streetcar days, and has generally used girder rail, ties, and ballast set in concrete pavement. By contrast, most European LRT systems have adopted a basically different type of track for use in pavement. It is built without conventional ties and is mechanically separated from the street pavement structure. Such track is quieter and may also be less costly; it appears to warrant serious consideration for new U.S. installations. /Author/

Acknowledgement: RRIS 00 301320
TRB
PB 288949

Landgraf, Robert J., "Light Rail Permanent-Way Requirements and Sources" -- see Track and Structures.

Schumann, John W., History of Railroad and Transit Joint Track Use, presented at the Workshop on Operational Issues in Designing Rail Transit and Commuter Railroad Services, sponsored by the American Society of Civil Engineers, Detroit, Mich., May 1977. 21 pp., Tabs., Refs.

This paper reviews examples of joint use in commuter and intercity railroads, railroad and rapid transit, and railroad and light rail.

12 SAFETY

(See also Rail-Highway Grade Crossings; Signals, Control and Communication; and Passenger Operations/Planning)

American Public Transit Association, Joint Trackwork--Electrical Design Guidelines -- see Track and Structures.

Boscia, Joseph F., "Operational Idiosyncrasies of a Subway-Surface System" -- see Passenger Operations/Level of Service.

California Public Utilities Commission, Transportation Division, Railroad Operations and Safety Branch, Rapid Transit Systems Section, Rules for the Design, Construction and Operation of Light Rail Transit Systems Including Streetcar Operations, prepared pursuant to Senate Bill 1855. San Francisco: Public Utilities Commission, amended January 18, 1978. 17 pp., Tab., Figs.

These rules cover definitions, alignment classification, construction, and operating requirements. PUC review requirements are cited. Rules regarding the light rail vehicle itself are also included.

Railroad Research Information Service, Highway Research Board, Special Bibliography: Safety-Related Technology, prepared for the Federal Railroad Administration. Washington, D.C.: Highway Research Board, March 1973. 348 pp.

This book contains over 1,900 abstracts of journal articles and research reports provided to RRIS by the Federal Railroad Administration. These abstracts are primarily in the subject areas of Track Structure, Train-Track Dynamics, and Rail Vehicles and Components. The abstracts are arranged according to the RRIS Classification Scheme. The book also contains Subject Term, Author, and Source Indexes.

Acknowledgement:
NTIS
PB 220220

RRIS 12 041665
DOT-OS-00035

06 SIGNALS, CONTROL, AND COMMUNICATIONS

(See also Track and Structures and Passenger Operations/Planning)

American Public Transit Association, Joint Trackwork--Electrical Design Guidelines -- see Track and Structures.

Burgin, Edward A., "Light-Rail Transit Signaling," Light-Rail Transit: Planning and Technology, Special Report 182, pp. 119-23. Washington, D.C.: Transportation Research Board, 1978.

This paper presents considerations regarding conventional signal systems that should be helpful to people planning a light-rail system. Attention is first directed to establishing the need for a signal system, including a discussion of its advantages and disadvantages on the basis of the technical, operational, economic, labor, and regulatory elements involved. A definition of conventional signal systems is provided, and the various types of systems are explained on the basis of their capabilities. Safety and failure modes are addressed as the key issues in any signal-system design. To illustrate the importance of all these factors, a comprehensive description of the new San Francisco Municipal Railway's subway signal system is presented, and conclusions are then drawn as to the general design concepts required for other future light-rail systems. /Author/

Acknowledgement: RRIS 06 301318
TRB
PB 288949

"Cleveland Upgrades Catenary," Railway Age, 182, no. 13 (July 13, 1981), 46, 47. Photos.

This article describes the modernization of Cleveland's Shaker Heights rapid transit line, which includes a new roadbed, new vehicles, and a stronger, upgraded overhead catenary system.

Groche, G., "Light Rail: A Transport System for the Future" -- see Passenger Operations/Level of Service.

06 SIGNALS, CONTROL, AND COMMUNICATIONS

Hamer, David, "Tyne & Wear Metro Defines a Control Philosophy," Railway Gazette International, 134, no. 6 (June 1978), 375-80. Figs., Photos.

> In 1979 8 km of Britain's first modern light rail system will commence operations in the northern suburbs of Newcastle-upon-Tyne. LRT practice in Germany and Belgium was the starting point in minimizing staff while keeping capital costs down. Although the 55-km network will be signaled throughout and stations will be monitored by CCTV from a central control room, routes will be set automatically through interlockings according to destination data derived from approaching trains.
>
> RRIS 06 178947

Korach, Robert S., "Operating a Light Rail System" -- see Passenger Operations/Level of Service.

Office of Technology Assessment and Battelle Columbus Laboratories, Automatic Train Control in Rail Rapid Transit. Washington, D.C.: Office of Technology Assessment, U.S. Congress, May 1976. 252 pp., Tabs., Figs., Photos., Refs., Apps., Glossary.

> This report covers all aspects of Automatic Train Control (ATC) in detail. It includes descriptions of five major U.S. rapid rail systems and discusses the problems and issues with the particular systems. The report is included in this bibliography because the ATC technology is applicable to LRT.

Straus, Peter, "Light-Rail Transit: Less Can Mean More" -- see Passenger Operations/Level of Service.

Touton, R. D., Jr., "Electrification and Control Systems for Light Rail Systems," Light Rail Transit, Special Report 161, pp. 86-92. Washington, D.C.: Transportation Research Board, 1975.

> This paper provides a broad overview of available electrification and control system technologies for new light rail systems. It is intended for groups with widely diverse backgrounds ranging from city planners to economists and consequently does not

deal with detailed, specific, technical design parameters. The portion on electrification is subdivided into sections on power generation, distribution, and collection on the light rail vehicle. The portion on control systems is broader and is divided first into propulsion control on the vehicle and then into systemwide operational control features that are further subdivided into sections on control on the vehicle, control among a number of vehicles, control as a central status reporting area, and automation. The paper concludes with general recommendations for a typical light rail system but recognizes that conditions might require additional or fewer optional features. This is done to emphasize the flexibility and adaptability of light rail systems. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 06 129814
TRB
PB 249150

15 SOCIOECONOMIC FACTORS

(See also Economics and Passenger Operations/Planning/Land Use and Development)

Armour, Audrey, and Reg Lang, Impacts of Urban Railways, Research Report 59. Toronto, Canada: Toronto/York University Joint Program in Transportation, April 1979. 280 pp., Tabs., Figs., Refs., Apps.

Developmental and environmental impacts of railroad construction and operation in Canadian urban centres increasingly are expected to present difficult issues for planners, decision-makers and administrators. Three categories of railroad/urban development concern exist: allocation of outmoded or poorly located rail facilities, encroachment of urban development on existing railways, and in the largest metropolitan areas, development of new light rail rapid transit. Addressing these concerns means confronting: (a) poorly developed concepts and methods for the assessment of developmental and environmental impacts; (b) inadequate integration of rail transport with land use planning and decision-making at municipal, regional and provincial levels; and (c) inadequate community consultation during such planning and decision-making, contributing to community opposition to specific project proposals. Phase 1 of the research examined the extent to which developmental and environmental impacts present/will present problems for urban areas in Canada; how these problems are being perceived and tackled in key centres, the state-of-the-art of assessing railway impacts, and community concerns with respect to urban railroads.

RRIS 15 302716

McKay, John P., Tramways and Trolleys: The Rise of Urban Mass Transport in Europe -- see History.

Paaswell, R. E., and others, An Analysis of Joint Development Projects (Final Report on First Year Tasks), prepared by the State University of New York, Buffalo, Transportation and Societal Systems Group, Department of Civil Engineering for the Urban Mass Transportation Administration. Buffalo, N.Y.: State University of New York, May 1979. 140 pp., Tabs., Figs., Refs., Apps.

15 SOCIOECONOMIC FACTORS

This report presents the results of the first year of study into a number od characteristics of an urban area in which joint development is taking place. The objectives of this study are to: 1) investigate the economic and population trends that influence economic and location decisions within the region; 2) investigate ways in which transit serves as a catalyst for development and in particular, delineate and quantify these ways; 3) determine the relative attractiveness of downtown as a retail attractor when compared with suburban regions; and 4) investigate analytic techniques that may help delineate the success of particular joint development projects. The study was carried out in the Buffalo, New York SMSA. Construction has recently begun on a six-mile Light Rail Rapid Transit System (LRRT). This study focuses on Central Business District and Regional development concerns with specific attention to the LRRT. The results of a number of tasks accomplished during the first year of analysis are discussed and brief summaries of discussions with local planners or policy makers are presented. The findings of the study found to be most significant are: 1) the phenomenon of suburbanization is so strong that competing redevelopment strategies, even those of major proportions may not succeed, except under the most focused and intense development conditions; 2) the importance of the combination of population decline and job category shifts must be realized; 3) accessibility is not the only, nor even the most important variable that should be measured by transit improvements; 4) variables that control retail activity linked to transit include quality of the activity, parking, and safety, and that currently, the CBD in Buffalo is not "attractive" enough to offer competitive pull to the suburban malls; and 5) the new LRRT is perceived of, together with a proposed joint development mall, as a positive gain for the CBD.

Acknowledgement:
NTIS
PB 300414

RRIS 15 302274
UMTA-NY-11-0020-79-1

Schumann, John W., "Evaluations of Operating Light-Rail Transit and Streetcar Systems in the United States" -- see Passenger Operations/Level of Service.

15 SOCIOECONOMIC FACTORS

Thompson, Gordon J., "Light Rail Transit Social Costs and Benefits," Light Rail Transit, Special Report 161, pp. 147-58. Washington, D.C.: Transportation Research Board, 1975. Tabs., Refs.

This paper identifies the social aspects of light rail transit and categorizes them according to the viewpoints of the rider, those on the wayside, the community, and the contributor of capital funds. The physical characteristics and service qualities of light rail transit accumulate to benefits that are judged to outweigh the social costs. Highlighted is the light rail transit attribute of serving a greater number of persons' travel needs through extensive distance covered for a given investment, frequent stations, easy access, and short door-to-door travel time. The ability of light rail transit to condense the amount of time between ground breaking and operation of service is stressed. This is credited to simpler construction enabled by need for narrower rights-of-way, use of sharper curves and steeper gradients, and tolerance of grade crossings. The ability of light rail transit to evolve at a later date, through additional investment, into conventional rapid transit is acknowledged. The paper draws conclusions from a 1960 study in Frankfurt, Germany, that served as the springboard for the now extensive development of light rail transit networks throughout Europe. Instances of specific social aspects are cited. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement:
TRB
PB 249150

RRIS 15 129821

01 TRACK AND STRUCTURES

(See also Signals, Control, and Communications and Right-of-Way)

American Public Transit Association, Joint Trackwork--Electrical Design Guidelines Task Force of the Power, Signals, and Communications and the Ways and Structures Committees, Joint Trackwork--Electrical Design Guidelines, funded by the Transit Development Corporation, Inc. Washington, D.C.: American Public Transit Association, Office of Technical & Research Services, September 1980. v.p., Figs., Photos., Apps.

These design guidelines cover the following: electrical conduit and cable, electrical connections to running rail and contact rail, wayside electrical equipment, contact rail support, special conditions, ballast resistance and fastener insulation, and air lines in the track bed.

Billing, J. R., and H. N. Grouni, "Design of Elevated Guideway Structures for Light Rail Transit" -- see Right-of-Way.

Fox, Gerald D., "The Design of Light-Rail Track in Pavement" -- see Right-of-Way.

Landgraf, Robert J., "Light Rail Permanent-Way Requirements and Sources," Light Rail Transit, Special Report 161, pp. 77-85. Washington, D.C.: Transportation Research Board, 1975. Refs.

This paper sets forth the technical requirements for the permanent way needed in construction of light rail transit facilities and then develops sources for assembling rights-of-way. Described first are the physical capabilities of light rail transit for grade, curves, and clearances. Requirements for the guideway are established with the development of standards for track work suited to light rail transit. The latest techniques in track component design are evaluated. Pitfalls to be avoided in light rail facility design are pointed out. General requirements for stations are set forth with particular emphasis on space needs. Types of platforms, shelters, and security enclosures are described. Station needs for light rail transit are contrasted with the needs of full-scale rapid transit. Sources that can be considered for light rail rights-of-way are treated in a way intended to stimulate the imagination of the engineer and planner in locating potential routes. Dealt with are surplus railroad tracks, boulevard and freeway center strips, canal

beds, stream channelization, electric transmission lines, parkways, street running, reservation of streets, and the selective application of elevated lines, bridges, and subways to light rail transit. Advantages and limitations of each type of right-of-way are explained. Proceedings of a National Conference conducted by TRB and sponsored by UMTA, Am Public Transit Assoc and U Penn, 23-25 June 1975.

Acknowledgement: RRIS 01 129813
TRB

Railroad Research Information Service, Special Bibliography: Safety-Related Technology -- see Safety.

Schumacher, Robert, "The Trolley Subway of Fort Worth Revisited" -- see Passenger Operations/Marketing.

Schwartz, Arthur, and John D. Wilkins, "Use of Railroad Rights-of-Way for Light-Rail Transit Systems" -- see Industry Structure and Company Management.

Wittemans, A., "Antwerpen's Pre-Metro Takes Shape as Construction Surges Ahead," Railway Gazette International, 136, no. 4 (April 1980), 279-82. Figs., Photos.

Faced with the problem of its narrow streets becoming increasingly clogged with road traffic, and patronage of bus and tram services declining because of low commercial speeds, the historic city of Antwerpen has plumped for a pre-metro in the city centre. With the opening of the second stage of Line 1 last month and construction of Line 2 well under way, the network is beginning to take shape. Narrowness of the streets and the need to avoid surface disruption caused by the cut-and-cover method of construction used for the first stage of Line 1 has led to a decision to build further lines and extensions using a bentonite shield to bore single-track tunnels one above the other.

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