

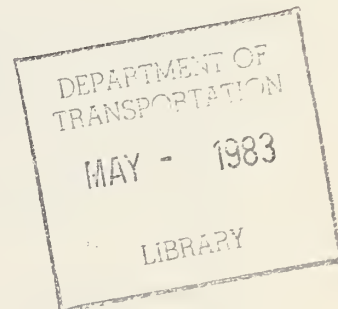
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81-56

TA-MA-06-0098-81-2  
T-TSC-UMTA-81-56

# **Annotated Bibliography of Rail Transit Safety, 1975- 1980, with Emphasis on Safety Research and Development**

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Cambridge MA 02142**



**September 1981  
Final Report**

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**U.S. Department of Transportation  
Urban Mass Transportation  
Administration**

**Office of Technology Development and Deployment  
Office of Safety and Product Qualification  
Washington DC 20590**

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16. Abstract <p>This annotated bibliography covers domestic and foreign material on rail transit safety and related safety, research and development (R&amp;D).</p> <p>The bibliography is concerned with safety aspects of the design and functioning of operating transit systems. Among the topics covered are train accidents (collisions, crashworthiness, derailments, fires), evacuations, patron safety on and off trains, trespassers, and safety management. Because of its operational emphasis, the scope of this bibliography does not include documents which deal exclusively with safety practices during facility construction, security against crime, or commuter rail.</p> <p>The primary period covered by this bibliography is 1975-1980.</p>				13. Type of Report and Period Covered Final Report 1975-1980	
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				6. Performing Organization Code DTS-722	
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9. Performing Organization Name and Address U.S. Department of Transportation Research and Special Programs Administration Transportation Systems Center Cambridge, Massachusetts 02142				11. Contract or Grant No. MA-06-0098	
				13. Type of Report and Period Covered Final Report 1975-1980	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Urban Mass Transportation Administration 400 Seventh Street, S.W. Washington, DC 20590				14. Sponsoring Agency Code UTD-50	
				15. Supplementary Notes	
16. Abstract  <p>This bibliography provides a comprehensive review of published literature concerning rail transit safety and includes 186 annotated entries. The report covers domestic and foreign material on rail transit safety and related safety research and development (R&amp;D) and supports the Safety R&amp;D Program Element of the Urban Mass Transportation Rail Transit Safety Program.</p> <p>The Bibliography is concerned with safety aspects of the design and functioning of operating transit systems. Among the topics covered are train accidents (collisions, crashworthiness, derailments, and fires); evacuations; patron safety on and off trains; trespassers; and safety management. Because of its operational emphasis, the scope of this Bibliography does not include documents which deal exclusively with safety practices during facility construction, security against crime, or commuter rail. The primary period covered by this Bibliography is 1975-1980. Work completed prior to 1975 is covered by the literature survey which forms Appendix D of the report: "Safety Program Plan Development for the Office of Safety and Product Qualification of the Urban Mass Transportation Administration," prepared by the University of Southern California in 1977.</p>					
17. Key Words Bibliographies; Collisions; Crashworthiness; Fires; Passenger Safety; Rail Transit Safety; Research and Development; Safety Management; Safety Research and Development			18. Distribution Statement Available to the public through the National Technical Information Service, Springfield, Virginia 22161		
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## PREFACE

The Urban Mass Transportation Administration (UMTA), in its role of overseeing modes of transportation that move millions of passengers daily, has undertaken the task of assessing the hazards and risks involving these operations. As an initial effort in this assessment, the Transportation Systems Center (TSC) has conducted a review of the rail safety literature for UMTA. This document provides a comprehensive review of published literature concerning rail transit safety and includes 186 annotated entries.

The authors wish to thank Roy Field of UMTA and Edward J. Boyle, formerly of UMTA, for their review and suggestions during the preparation of this report. They also wish to acknowledge the contributions of I. Michael Wolfe and Robert Berk (TSC), who provided technical guidance in the conception and design of the bibliography; V. Lynne Meredith, Raytheon Service Company (RSC), who assisted in the initial literature search and Stephanie H. Markos, (RSC), who prepared the final edition for publication.

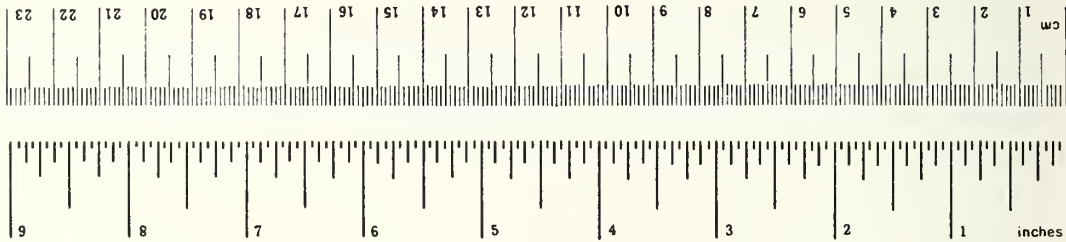
# METRIC CONVERSION FACTORS

## Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
<b>AREA</b>				
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>
	acres	0.4	hectares	ha
<b>MASS (weight)</b>				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	tonnes	t
	(2000 lb)			
<b>VOLUME</b>				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

## Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
<b>AREA</b>				
cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>
km <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>
ha	hectares (10,000 m <sup>2</sup> )	2.5	acres	
<b>MASS (weight)</b>				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
<b>VOLUME</b>				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m <sup>3</sup>	cubic meters	35	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.3	cubic yards	yd <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



\* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10.286.

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## 1. INTRODUCTION

### 1.1 SCOPE AND PURPOSE

This annotated bibliography covers domestic and foreign material on rail transit safety and related safety research and development (R&D). The document supports the Safety R&D program element of the Urban Mass Transit Administration (UMTA) Rail Transit Safety Program.

The bibliography is concerned with safety aspects of the design and functioning of operating transit systems. Among the topics covered are train accidents (collisions, crashworthiness, derailments, fires), evacuations, patron safety on and off trains, trespassers, and safety management. Because of its operational emphasis, the scope of this bibliography does not include documents which deal exclusively with safety practices during facility construction, security against crime, or commuter rail.

The primary period covered by this bibliography is 1975-1980. Work completed prior to 1975 is covered by the literature survey which forms Appendix D of "Safety Program Plan Development for the Office of Safety and Product Qualification of the Urban Mass Transportation Administration," prepared by the University of Southern California (USC) in 1977.

### 1.2 SEARCH PROCESS

Leads to the entries in this bibliography were obtained by a combination of document and abstract review, direct contact with transportation research organizations, and consultation with technical experts at TSC. The Appendix lists the abstracting services and comprehensive bibliographies which were the backbone of the search effort, particularly with regard to work in the United States.

To get adequate coverage of foreign sources, mail inquiries were sent to foreign technical organizations, manufacturers and libraries, and computer bibliographic searches were requested from C.E.R.T.U.M. and I.R.T.\* In addition, journals and magazines related to rail transportation were reviewed for articles reporting foreign R&D on safety. These foreign search efforts are also summarized in the Appendix.

### 1.3 FORMAT OF THE BIBLIOGRAPHY

The bibliographic entries are presented alphabetically and are designated by alphanumeric reference numbers. Ten safety-related topic areas have been specified, and each entry has been coded according to its topic or topics. A subject matrix and bibliography guide has been prepared to assist readers in finding appropriate subject entries. Each of these format characteristics is explained in this section.

The order of entries in the bibliography is alphabetical by title, starting with the first significant word of the title. The first significant word rule disregards the articles (definite or indefinite) and prepositions

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\*The full titles and addresses of these organizations are listed in Section 1.4.

(unless forming part of a hyphenated word). For titles in foreign language, this alphabetization procedure is applied to the English translation of the title.

Each entry has been assigned a reference number which reflects the alphabetical arrangement. Those entries for which the first significant word starts with "A" are numbered in sequence as A 1, A 2, A 3 etc., which are followed in sequence by B 1, B 2, B 3, etc. An asterisk (\*) is placed before the letter if the work is from a foreign source, whether in English language or not. Thus, \*A 10 reports work from Spain, but appears between two unstarred numbers, A 9 and A 11, which report work from the United States. Proceedings of an international conference are not considered as a foreign source if the conference was held in the United States. A periodical published in the United States is not considered as a foreign source even though the word "International" is included in its title (e.g., International Railway Journal).

Ten primary safety categories have been established, as follows:

1. Fire (includes smoke and fume hazards)
2. Emergency evacuation
3. Collisions
4. Crashworthiness
5. Derailment detection and prevention
6. On-train safety (includes boarding and alighting)
7. Off-train safety (stations, stairs, etc.)
8. Safety management and training (includes some relevant general safety studies not classifiable into other categories)
9. Trespassers and suicides
10. Software safety.

Category 10, software safety, is a broad generic term which needs to be carefully defined for the focussed purposes of this bibliography. In the general computer field, there is an extensive and rather open-ended body of literature which bears on computer programming, software design, computer design, privacy and security against unauthorized intrusion, etc. This bibliography does not cover these areas in full generality; entries in this category must be restricted to those which indicate potential applicability to transit operation. On the other hand, looking beyond the narrow technical definition of "software", we understand the software safety category to include all efforts and techniques for enhancing the integrity or reliability of any on line control system in rail transit operations. In addition to specific software techniques, this comprehends computer hardware considerations (e.g., hardware reliability, back-up computers in transit applications), fallback operating modes, (e.g., voice control), redundancy and fail-safeness of sensors and indicators used in transit operations.



Many entries in the bibliography pertain to more than one safety category. For example, our Reference No. B 1 is relevant to three categories (3, 5, and 8) as indicated in the upper right corner of the entry. (Multiple subjects make it impractical and duplicative to segregate entries by category.) To permit retrieval of items relevant to any specific safety category, a "Subject Matrix and Bibliography Guide" is given in Section 2, preceding the annotated bibliographic entries. This matrix, which is adapted from an analogous matrix in the USC bibliography, has a line for each entry (listed in the same alphabetical order as in the annotated bibliography). An "X" is placed in one or more of the nine blocks along each line to show at a glance the relevant safety category or categories for that entry. To illustrate by the example cited, Reference B 1 shows an "X" in each of the columns 3, 5, and 8. The reader may glance down a subject column, note those "X-marked" titles which appear of interest, and find the abstract by using the alphanumeric reference numbers. The use of this matrix permits us to assign entries to more than one category where that is appropriate. No attempt was made to distinguish primary and secondary categories for multi-category entries.

Each entry contains standard publication and reference information, plus an annotation. For the sake of uniformity, a space is provided to identify the author, the author's organization and the sponsor of the research; wherever this item of information is not applicable or not available it is entered as "NA". Dates are given as completely as available information permits; in most cases (e.g., journal articles, reports) the document usually shows month and year. For conferences it is usually possible to specify the actual days on which the conference was held; later published proceedings do not normally specify a separate publication date. The annotation consists of an abstract or summary, with the authorship of the summary noted in parentheses; annotations with no parenthetical entry have been prepared by the editors of this bibliography. The annotation also specifies the original language for all foreign documents (asterisked reference numbers). If the document is not written in English, the existence of English language summaries or abstracts is noted.

#### 1.4 REFERENCE ABBREVIATIONS

##### 1.4.1 Research and Report Archive Acronyms

Several organizations from which reports may be obtained are referred to in the entries by acronym. The full names and addresses of these organizations are listed here. (The presence or absence of periods within an acronym merely reflects the difference between European and American usage.)

- |      |   |   |
|------|---|---|
| AIAA | - | American Institute of Aeronautics and Astronautics<br>1290 Avenue of the Americas<br>New York, N.Y. 10019 |
| IEEE | - | Institute of Electrical and Electronics Engineers<br>345 East 47th Street<br>New York, N.Y. 10017         |

- ISA - Instrument Society of America  
67 Alexander Drive  
P.O. Box 12277  
Research Triangle Park, North Carolina 27709
- NTIS - National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161
- R.A.T.P. - Regie Autonome des Transports Parisiens  
53 ter Quai des Grandes-Augustines  
75271 Paris, Cedex 06, France
- TRB - Transportation Research Board  
Publications Office  
2101 Constitution Ave., N.W.  
Washington, D.C.
- TSC - Transportation Systems Center  
U.S. Dept. of Transportation  
Kendall Square  
Cambridge, MA. 02142
- U.I.T.P. - Union Internationale de Transports Publiques  
19 Avenue de l' Uruguay  
Brussels B-1050, Belgium

#### 1.4.2 Abstracting Service Acronyms

- C.E.R.T.U.M. - Centro Esperimenti e Ricerche di  
Trasporti Urbani e Metropolitan  
(Center for Experiments and Research  
in Urban and Subway Transports)  
00185 Roma - Via Giolitti 34 Italy
- C.E.M.T. - Conference Europeenne des Ministres de Transports  
33 Rue de Franqueville 75775  
Paris, Cedex 16, France
- EIA - Engineering Index Annual  
United Engineering Center  
345 East 47th Street  
New York, N.Y. 10017
- I.R.T. - Institut de Recherche des Transports  
2 Avenue du G1 Mailleret-Joinville  
9414 Arcueil, France
- RRIS - Railroad Research Information Service  
(A service of TRB; address given above)

#### 1.4.3 LRT and RRT Transit System Acronyms

- BART - Bay Area Rapid Transit District

CTA	-	Chicago Transit Authority
GCRTA	-	Greater Cleveland Regional Transit Authority
MARTA	-	Metropolitan Atlanta Rapid Transit Authority
MBTA	-	Massachusetts Bay Transportation Authority
NOPSI	-	New Orleans Public Service Inc.
NYCTA	-	New York City Transit Authority
PATCO	-	Port Authority Transit Corporation
PAT	-	Port Authority of Allegheny County
PATH	-	Port Authority Trans-Hudson Corporation
SEPTA	-	Southeastern Pennsylvania Transit Authority
MUNI	-	San Francisco Municipal Railway
TNJ	-	Transport of New Jersey
WMATA	-	Washington Metropolitan Area Transportation Authority

#### 1.4.4 Organization Acronyms

APTA	-	American Public Transit Association 1225 Connecticut Avenue, N.W. Washington, D.C. 20036
DOT	-	U.S. Department of Transportation
FRA	-	Federal Railroad Administration, DOT
NTSB	-	National Transportation Safety Board
RSPA	-	Research and Special Programs Administration, DOT
TSC	-	Transportation Systems Center, DOT
UMTA	-	Urban Mass Transportation Administration, DOT

Any other acronyms are defined within the bibliographic entry to which they pertain, except that companies with names in essentially acronym form are not further explained.

## 2. SUBJECT MATRIX AND BIBLIOGRAPHY GUIDE

This matrix has a line for each annotated bibliographic entry, listed in the same alphabetical order as the entries in the annotated bibliography. An "X" is placed in one or more of the nine blocks along each line to show at a glance the relevant safety category or categories for that entry. To illustrate by example, B 1 shows an "X" in each of the columns 3, 5, and 8. The reader may glance down a subject column, note those "X-marked" titles which appear of interest, and find the abstract in the order of its alphanumeric reference numbers.



REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
A 1	Accident/Incident Bulletin	X		X	X	X	X	X	X		
A 2	ACT-1: Urban Rapid Rail Vehicle and Systems Program. Engineering Tests of ACT-1 Vehicle at Transportation Test Center				X		X				
A 3	Anatomy of a Train Crash			X		X	X		X		
*A 4	Anthropotechnical Studies Into the Legibility of Writing In Public Passenger Transport							X		X	
A 5	Application of Lexan to Subway Cars					X					
A 6	An Approach to Safety and System Assurance In Urban Mass Transportation								X		
A 7	Assessment of Current U.S. Department of Transportation Fire Safety Efforts	X									
A 8	An Assessment of the Crashworthiness of Existing Urban Rail Vehicles.			X	X						

REFERENCE

		1 Fire	2 Emergency evacuation	3 Collisions	4 Crashworthiness	5 Derailment	6 On-train safety	7 Off-train safety	8 Safety management, training	9 Trespassers and suicides	10 Software safety
A 9	Assessment Of The Risks Associated with The Use Of Carbon Fibers In Surface Transportation	X									
*A 10	The A.T.C. and A.P.B. Systems in Automatic Train Running			X							X
A 11	At-Grade Crossings of Light Rail Transit (Abridgement)			X							
*A 12	Automatic Control of Trackbound Vehicles			X							X
A 13	Automatic Couplings Speed Transit Turnarounds				X						
*A 14	An Automatic Operating System for the Rhein-Ruhr Urban Rail System			X							X
A 15	Automatic Train Control for Rail Rapid Transit			X							X
A 16	Automatic Train Control in Rail Rapid Transit			X							X
*A 17	Automation and Safety Operation of Metropolitan Railways Based on High Tension Impulse Track Circuits			X							X

REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
*B 1	BART Nears the End of the Long Haul			X		X			X		
B 2	BART - The Road is Still Bumpy, but the Goal is in Sight	X		X							X
B 3	A Baseline Automatic Train Control System Incorporating System Assurance Considerations			X							X
*B 4	The Brussels Metro	X		X			X		X		
C 1	Characteristics of Urban Transportation Systems - A Handbook for Transportation Planners								X		
*C 2	Charting the Limits of Unmanned Operation								X		X
C 3	Commonalities in Transportation Fire Safety: Regulations, Research and Development and Data Bases	X									
C 4	The Common Right-of-Way Problem			X							
*C 5	Computer Application in Rapid Transit										X

REFERENCE

	1	2	3	4	5	6	7	8	9	10
	Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
*C 6			X							X
C 7			X							X
*C 8	X									
C 9				X		X				
D 1			X							
*D 2			X							X
*D 3	X									



REFERENCE

	1	2	3	4	5	6	7	8	9	10
	Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
D 4	Directory of DOT Fire Research, 1979 Edition	X								
*D 5	Door Locking System for Passenger Coaches					X				
*E 1	Edmonton's North East Light Rail Rapid Transit Line	X								
E 2	Electrical Insulation Fire Characteristics. Vol. I: Flammability Tests	X								
E 3	Electrical Insulation Fire Characteristics. Vol. II: Toxicity	X								
E 4	Energy Absorbing Bumping Posts		X	X						
E 5	Evacuation and Rescue in Automated Guideway Transit Vol. I: Data Collection, Scenarios and Evaluation Vol. II: Guidebook		X							

REFERENCE

		1 Fire	2 Emergency evacuation	3 Collisions	4 Crashworthiness	5 Derailment	6 On-train safety	7 Off-train safety	8 Safety management, training	9 Trespassers and suicides	10 Software safety
E 6	Evaluation of Signal/Control System Equipment and Technology.			X			X				X
E 7	Expansion of System Safety Program Planning to the Railroad Industry -- Signal Applications			X				X			
*E 8	Experimental Railway Signalling System Using Micro-processors			X							X
*F 1	Fail-Safe Data Processing in Railway Signalling Systems										X
F 2	Fire Blackens BART Image	X									
F 3	Fire Hazard Evaluation of BART Vehicles	X									
*F 4	Fire Hazard Evaluation of Cables and Materials	X									
F 5	A Fire Hazard Evaluation of the Interior of WMATA Metrorail Cars	X									



REFERENCE

1 Fire  
 2 Emergency evacuation  
 3 Collisions  
 4 Crashworthiness  
 5 Derailment  
 6 On-train safety  
 7 Off-train safety  
 8 Safety management, training  
 9 Trespassers and suicides  
 10 Software safety

		1	2	3	4	5	6	7	8	9	10
*F 6	Fire In Rapid Transit Tunnels	X	X								
*F 7	Fire Prevention and Rescue Work in the Metro	X	X					X			
*F 8	Fire Prevention: Electrical Cables	X						X			
*F 9	Fire Prevention Facilities at The Kesei-Ueno Station	X						X			
*F 10	Fire Prevention Facility for the Longest Tunnel of The New Tohoku Line	X	X								
F 11	Fire Protection Systems on WMATA Metro	X									
F 12	Fire Remains A Big Potential Hazard	X									
F 13	Fire Safety and Fire Hazards Related to Polymeric Materials in Cars of WMATA	X									

REFERENCE

- 1 Fire
- 2 Emergency evacuation
- 3 Collisions
- 4 Crashworthiness
- 5 Derailment
- 6 On-train safety
- 7 Off-train safety
- 8 Safety management, training
- 9 Trespassers and suicides
- 10 Software safety

F 14	Fire Safety Aspects of Polymeric Materials. Volume 8 - Land Transportation Vehicles	X						
F 15	Fire Safety in Transit Vehicles	X						
F 16	FRP Third Rail Protective Cover					X		
*G 1	A General Consideration Concerning Fire Safety in the Subway	X	X				X	
*G 2	The Glasgow Underground - Design, Development and Construction of the New Cars			X	X			
G 3	A Green Light for Advanced Train Controls			X				X
G 4	Guidelines for the Design and Evaluation of Human Factors Aspects of Automated Guideway Transit Systems	X	X			X		X

REFERENCE

1 Fire  
 2 Emergency evacuation  
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 5 Derailment  
 6 On-train safety  
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 8 Safety management, training  
 9 Trespassers and suicides  
 10 Software safety

	1	2	3	4	5	6	7	8	9	10
H 1 Hazard Analysis--Space Applications to Mass Transit								X		
H 2 Hong Kong Metro Cars Near Completion	X	X								
H 3 How System Safety Works in the NYC Transit Authority			X	X	X			X		
I 1 Identification and Evaluation of Operational Alternatives for Materials Data Base	X									
I 2 Identification of the Fire Threat in Urban Transit Vehicles	X									
*I 3 In-Cab TV Platform Monitor						X				
I 4 Increased Rail Transit Vehicle Crashworthiness in Head-on Collisions. Volume I - Initial Impact			X	X						
I 5 Increased Rail Transit Vehicle Crashworthiness in Head-on Collisions. Volume II - Primary Collision			X	X						

REFERENCE

	1 Fire	2 Emergency evacuation	3 Collisions	4 Crashworthiness	5 Derailment	6 On-train safety	7 Off-train safety	8 Safety management, training	9 Trespassers and suicides	10 Software safety
I 6			X	X						
I 7			X	X						
I 8										X
I 9							X			
I 10										X

REFERENCE

- 1 Fire
- 2 Emergency evacuation
- 3 Collisions
- 4 Crashworthiness
- 5 Derailment
- 6 On-train safety
- 7 Off-train safety
- 8 Safety management, training
- 9 Trespassers and suicides
- 10 Software safety

L 1	LBL Role and Recommendations with Respect to PUC Hearings on BART Safety Appliances and Procedures		X					X		
L 2	Light-Rail Transit: Planning and Technology		X			X				X
L 3	Light Rail Transit - Proceedings of a National Conference						X		X	
L 4	Light-Rail Transit Signalling		X							
*L 5	The Lille Metro	X	X	X	X	X	X	X	X	X
*L 6	London's Underground System Goes off the Rails	X								
M 1	MARTA Systems Safety, Fire Protection, and Code Documentation	X	X					X		



REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Deraillment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
M 2	MARTA Systems Safety Verification: A Rail Rapid Transit Application of Systems Safety Technology							X			
M 3	MARTA Train Control System - A View from the Wayside		X				X				X
M 4	Measurements and Observations of the Toxicological Hazard of Fire in a Metrorail Interior Mock-Up	X									
M 5	Methodology for the Design of Urban Transportation Interface Facilities							X X			
M 6	Moving People Safely	X X X				X X	X X	X X		X	
*N 1	New Applications of the Teloc-E Electronic Speed Measuring System			X		X					X
N 2	New Brake Equipment for Cramped Transit Conditions			X						X	
*N 3	New Developments and Applications in Hasler Railway Electronics			X							



REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
*N 4	New Generation of Rail Cars Boosts Paris Metro Capacity	X									
*N 5	The New Hong Kong Underground Railway								X		
N 6	New York City Transit Authority Design Guidelines: Signals and Communication			X							X
N 7	NTSB Safety Recommendations	X	X	X	X	X	X	X	X		
*O 1	Operating Control Techniques in Local Rail Traffic			X							X
O 2	Operational Safety of Transportation Systems								X		X
P 1	Passenger Safety and Convenience Services in Automated Guideway Transit. Volume I, Data Collection Scenarios and Evaluation Volume II, Guidebook								X		
*P 2	A Peculiarity of Railway Signalling: The Overlap			X							

REFERENCE

	1	2	3	4	5	6	7	8	9	10
	Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
*P 3 People Movers and the March of the Microchip										X
*P 4 Personnel-Free Operation in the OPNV		X	X		X	X	X	X	X	
P 5 Personnel Safety on Electrified Railroads	X	X				X	X			
P 6 Planning and Design of Intermodal Transit Facilities							X			
P 7 Plastics for Mass Transit Vehicles	X									
*P 8 Points and Traffic Lights under Common Control using Vetag										
P 9 Preliminary Analysis of the Effects of Non-Linear Creep and Flange Contact on Truck Performance in Curves					X					

REFERENCE

1 Fire  
 2 Emergency evacuation  
 3 Collisions  
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 6 On-train safety  
 7 Off-train safety  
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 9 Trespassers and suicides  
 10 Software safety

	1	2	3	4	5	6	7	8	9	10
*P 10 The Price of Safety								X		
P 11 Proceedings of the Third UMTA R&D Priorities Conference, Cambridge, Massachusetts, November 1978. Vol. V: UMTA Special Technology Programs Workshops	X	X	X	X	X	X	X	X	X	X
P 12 Proceedings of the Urban Rail Vehicle Crashworthiness Workshop Held at Cambridge, Massachusetts on April 13-14, 1978				X						
*P 13 Process Controllers for Traffic Direction										
R 1 Rail Rapid Transit Safety Review								X		
R 2 Railroad Accident Report: Bay Area Rapid Transit District Fire on Train No. 117 and Evacuation of Passengers while in the Transbay Tube, San Francisco, California, January 17, 1979	X	X						X		

REFERENCE

		1 Fire	2 Emergency evacuation	3 Collisions	4 Crashworthiness	5 Derailment	6 On-train safety	7 Off-train safety	8 Safety management, training	9 Trespassers and suicides	10 Software safety
R 3	Railroad Accident Report: Chicago Transit Authority Collision of Trains No. 104 and No. 315 at Addison Street Station, Chicago, Illinois, January 9, 1976			X	X				X		
R 4	Railroad Accident Report: Collision of Port Author- ity of Allegheny County Trolley Car No 1790 and Bus No. 2413, Pittsburgh, Pennsylvania, February 10, 1978			X					X		
R 5	Railroad Accident Report: Derailment of New York City Transit Authority Subway Train, New York, New York, December 12, 1978					X	X		X		
R 6	Railroad Accident Report: Head-On Collision of Two Greater Cleveland Regional Transit Authority Trains, Cleveland, Ohio, July 8, 1977			X					X		
R 7	Railroad Accident Report: Rear End Collision of Three Massachusetts Bay Transpor- tation Authority Trains, Boston, Massachusetts, August 1, 1975			X					X		



REFERENCE

		1 Fire	2 Emergency evacuation	3 Collisions	4 Crashworthiness	5 Derailment	6 On-train safety	7 Off-train safety	8 Safety management, training	9 Trespassers and suicides	10 Software safety
R 8	Railroad Accident Report: Rear End Collision of Two Chicago Transit Authority Trains, Chicago, Illinois, February 4, 1977			X		X			X		
R 9	Railroad Accident Report: Rear End Collision of Two Greater Cleveland Regional Transit Authority Trains, Cleveland, Ohio, August 18, 1976			X					X		
R 10	Railroads: Green Light for the Bullets										X
R 11	Rail Safety/Equipment Crash- worthiness Vol. I: A Sys- tems Analysis of Injury Mini- mization in Rail Systems			X	X	X	X				
R 12	Rail Safety/Equipment Crash- worthiness Vol. II: Design Guide			X	X	X	X				
R 13	Rail Safety/Equipment Crash- worthiness Vol. III: Pro- posed Engineering Standards			X	X	X	X				

REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Traspassers and suicides	Software safety
R 14	Rail Safety/Equipment Crashworthiness Vol. IV: Executive Summary			X	X	X	X				
R 15	Rail Transit Safety Annual Report	X		X	X	X	X	X	X		
R 16	Rapid Transit--New Use for Hot Box Detectors					X					
*R 17	Reaction of Materials to Fire	X									
R 18	Recommended Prerequisites for Replacing CABS with SOR in BART Train Control Systems			X							X
*R 19	Reduction of Smoke Emissions from Telecommunications Cables	X									
*R 20	Reflections on the Safety Studies of Urban Public Transportation								X		
R 21	Reliability and Availability Assessment Criteria, Data Inputs, Analysis Methods for Mass Transit System								X		



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1 Fire  
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 7 Off-train safety  
 8 Safety management, training  
 9 Trespassers and suicides  
 10 Software safety

R 22	Reliability Comes to the Transit Industry						X	
R 23	Reliability Engineering in Transportation--A Pragmatic Approach						X	X
R 24	Reliability Improvement of BART Train Control		X					X
*R 25	Reliable Microprocessor-Aided Design of Intricate Automatic Process Systems							X
R 26	A Report on Investigation into Rail Passenger Safety	X	X	X	X	X	X	
R 27	A Report on Light Rail Transit: Surface Operations						X	
*R 28	Research on Prevention of Train Fire	X						
S 1	Safe Braking Model for a Rail Rapid Transit System		X	X	X			
S 2	Safe Train Separation in Modern Rapid Transit Systems		X					X

REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Deraillment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
S 3	Safety and System Assurance Resources Applied to the Design and Development of a Rail Rapid Transit System								X		X
S 4	Safety and System Assurance Reviews								X		
S 5	Safety and System Assurance Study								X		
S 6	Safety/Availability Methods Applied to BART								X		X
*S 7	Safety By Redundancy			X							X
S 8	Safety Effectiveness Evaluation of Rail Rapid Transit Safety	X	X				X	X	X		
S 9	Safety Estimates for Urban Transit Systems								X		
*S 10	Safety in its Technical Aspect and in the Aspect of User Behavior								X		
S 11	Safety in Urban Mass Transportation: Guidelines Manual and Research Report Summary								X		

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1 Fire  
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 10 Software safety

REFERENCE	1	2	3	4	5	6	7	8	9	10
S 12 Safety or Reliability - Must We Choose?										X
S 13 Safety Priorities in Rail Rapid Transit	X	X					X	X		
S 14 The Safety Program for the Baltimore Region Rapid Transit System	X		X					X		X
*S 15 Safety Psychology: A Review of the Literature								X		
*S 16 Safety Stops at Terminals Evaluated			X							
*S 17 Safety Study for System Val	X	X	X	X	X	X	X	X	X	X
*S 18 Safety System for Train Operations			X			X				X
*S 19 Search for Electric Cables with Low Noxious Pyrogenation and Combustion for the Subway in Lyon	X									
S 20 Simulators Used By WMATA			X							X

REFERENCE

		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
*S 21	Smoke and Fire at Fixed Electrical Installations	X									
*S 22	A Solution to Train Fires	X					X				
*S 23	Status of the Studies Conducted by the R.A.T.P. in Cable Improvements	X									
*S 24	Storsstockholm Lokaltrafik: Report	X					X	X			
*S 25	Study of Fires in Subway Systems	X					X	X	X		
S 26	Subway Environmental Design Handbook, Vol. I: Principles and Applications, Second Edition	X	X						X		X
*S 27	System Assurance in a Rapid Transit System										X
S 28	System Safety Program Plans							X			



REFERENCE

1 Fire  
 2 Emergency evacuation  
 3 Collisions  
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 7 Off-train safety  
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 9 Trespassers and suicides  
 10 Software safety

S 29	System Safety/Risk Analysis Techniques Applied to Motor Vehicles and Rapid Transit Systems				X	
*T 1	Teloc-E: A New Electronic Speed and Distance Measuring System for Railways		X	X		X
*T 2	Teloc-E Hybrid Systems		X	X		X
*T 3	Test Procedures for the Inflammability of Electrical Cables	X				
*T 4	Tokyo Underground and its Disaster Prevention System	X			X	
T 5	Track-Guided Radar for Rapid Transit Headway Control		X			
T 6	Traffic Control Measures at Highway Railway-Grade Crossing with Provisions for Light Rail Transit		X			
*T 7	Traffic Control Systems for Railways		X			X
T 8	Transit Station Planning and Design: State of the Art				X	



REFERENCE		1	2	3	4	5	6	7	8	9	10
		Fire	Emergency evacuation	Collisions	Crashworthiness	Derailment	On-train safety	Off-train safety	Safety management, training	Trespassers and suicides	Software safety
T 9	Transit Vehicle Material Specifications Using Release Rate Tests for Flammability and Smoke	X									X
T 10	Transportation Safety Information Report (Quarterly)						X	X	X		
T 11	Transportation System Safety Methodology								X		
T 12	Tunnel Fire Specter Sparks Many Safety Programs	X	X				X	X	X		
*T 13	Tyneside Report 8, Part 1: Rolling Stock						X				
U 1	UMTA Transportation Planning System Reference Manual										X
U 2	Urban Rail Supporting Technology, A Five Year Progress Summary 1971-1976								X		

REFERENCE

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- 10 Software safety

		1	2	3	4	5	6	7	8	9	10
U 3	Urban Rapid Rail Vehicle and Systems Program				X		X				
W 1	Washington Metro ATC System			X							X
W 2	With Low Smoke, Toxicity, Burning Rate, Can Plastics Fill Aircraft and Transit Needs?	X									

### 3. ANNOTATED BIBLIOGRAPHIC ENTRIES

The annotated bibliographic entries are presented in the order of their alphanumeric reference numbers shown in the upper left hand corner of each entry. Asterisks (to indicate a foreign source) are disregarded in this ordering process. Subject codes are in the upper right hand corner.

Each entry contains standard publication and reference information, plus an annotation. For the sake of uniformity, a space is provided to identify the author, the author's organization and the sponsor of the research; wherever this item of information is not applicable or not available it is entered as "NA". Dates are given as completely as available information permits; in most cases (e.g., journal articles, reports) the document usually shows month and year. For conferences it is usually possible to specify the actual days on which the conference was held; later published proceedings do not normally specify a separate publication date. Each annotated bibliographic entry consists of a summary, with the authorship of the summary noted in parentheses; where authorship is not identified, the summary has been prepared by the editors of this bibliography. The annotation also specifies the original language for all foreign documents (asterisked reference numbers). If the document is not written in English, the existence of English language summaries or abstracts is noted.

Ref. No.: A 1

Safety Categories: 1,3,4,5,6,7,8

Title: Accident/Incident Bulletin

Date: Annual

Source: See Below

Author: NA

Organization: FRA, Office of Safety

Sponsor: Same

In accordance with 49 CFR 225, railroads are required to file monthly accident/incident reports with the Office of Safety, Federal Railroad Administration. For the purpose of these requirements a "railroad" is any system of surface transportation of persons and property over rails, including line haul freight and passenger railroads, switching and terminal railroads, and passenger carrying railroads, such as rapid transit, commuter, scenic, street, subway, elevated, cable and cog railways. (From Introduction)

For the years 1975, 1976 and 1977 (the first three years covered by this bibliography) rail rapid transit carriers were required to file reports with FRA. Numerous tables pertaining to rail rapid transit carriers are contained in the Bulletins for those years. Beginning with 1978, tables and data pertaining to rail rapid transit are not published in this Bulletin; see Ref. R 16.

Sources for these documents are as follows.

Accident/Incident Bulletin No. 148, Calendar Year 1979:  
Superintendent of Documents, U.S. Government Printing Office,  
Washington, D.C. 20402, citing stock number 1980 0-311-586/259.

Accident/Incident Bulletin No. 147, Calendar Year 1978:  
Superintendent of Documents, U.S. Government Printing Office,  
Washington, D.C. 20402, citing stock number 1979 0-634-022/464.

Accident/Incident Bulletins covering Calendar Years prior to 1978 are obtainable only through the FRA Office of Safety.

Ref. No.: A 2

Safety Categories: 4,6

Title: ACT-1: Urban Rapid Rail Vehicle  
and Systems Program. Engineering  
Tests of ACT-1 Vehicle at Trans-  
portation Test Center.

Date: Dec 1979

Source: NTIS, Order No.  
PB80-155 286

Author: NA

Organization: Boeing Vertol Co., Surface  
Transportation Systems Dept.,  
Philadelphia, PA. 19142

Sponsor: UMTA

This document contains a description of the AGT vehicles as delivered to UMTA, including major changes incorporated during testing at the Transit Test Center (TTC), in Pueblo, Colorado, and the rationale for these changes. The test program is described in detail and results are presented for checkout, adjustment, engineering, and acceptance testing of the AGT vehicles. These vehicle tests include: (1) crash attenuation; (2) performance tests, i.e., acceleration, speed regulation, deceleration, power consumption, thermal duty cycle, slip/spin efficiency, ride quality data, and acoustics data. The instrumentation system description is included in the appendix. The test program results in operating efficiency; technology advances in component design and integration; and of considerations for passenger safety, security, and comfort. (Author)

Note: See also Ref. U 3.



Ref. No.: A 3

Safety Categories: 3,5,6,8

Title: Anatomy of a Train Crash

Date: June 1977

Source: Mass Transit  
Vol. 4, No. 6, June 1977.  
pp. 12-16

Author: D. Young

Organization: Mass Transit

Sponsor: NA

The rear-end collision involving two trains of the Chicago Transit Authority, on a curve on the elevated Loop in downtown Chicago on February 4, 1977, resulted in 11 deaths and 189 injuries. The crash caused four cars to drop to the street. The involvement of the CTA's automatic train control system, as well as the human failure, are discussed. (RRIS)

See also Ref. R 8.

Ref. No.: \*A 4

Safety Categories: 7,9

Title: Anthropotechnical Studies  
Into the Legibility of Writing  
In Public Passenger Transport

Date: Dec 1977

Anthropotechnische Untersuch-  
ungen zur Lesbarkeit von  
Schriftzeichen im Öffentlicher  
Personenverkehr

Source: Eisenbahntechnische  
Rundschau, Vol. 26, No. 12,  
Dec 1977, p. 843

Author: H. J. Reinig

Organization: NA

Sponsor: NA

This article describes the methodology and results of studies conducted on visibility and legibility of signs in stations. Passenger movement is considered, as well as the effectiveness of sign placement for varying angles of viewing.

The article is written in German with an English summary.

Ref. No.: A 5

Safety Categories: 5

Title: Application of Lexan to  
Subway Cars

Date: Jan 1978

Source: Mass Transit  
Vol. 5, No. 1, Jan 1978,  
p. 34

Author: Mass Transit

Organization: Same

Sponsor: NA

Lexan plastic wheels and track were tested at Princeton University on a 1/5 scale model railway car to study derailments, wear on vehicle and track, and quality of ride.

Ref. No.: A 6

Safety Categories: 8

Title: An Approach to Safety and System  
Assurance In Urban Mass  
Transportation

Date: Jan 20-22, 1976

Source: Proceedings, 1976  
Annual Reliability and Main-  
tainability Symposium,  
Las Vegas, Jan 20-22, 1976,  
pp. 306-308

Author: R. Field

Organization: UMTA, Office of Transit  
Management

Sponsor: NA

The article is a general discussion of safety and system assurance planning which emphasizes the program of the Office of Transit Management in this area.

Ref. No.: A 7

Safety Categories: 1

Title: Assessment of Current U.S.  
Department of Transportation  
Fire Safety Efforts

Date: July 1979

Source: NTIS, Order No.  
PB-299 110/AS

Author: W.T. Hathaway, I. Litant

Organization: TSC

Sponsor: DOT, RSPA

This report presents the results of an assessment of current fire safety efforts related to transportation. Emphasis has been placed on Federal Government efforts, particularly those by the U.S. Department of Transportation.

In conducting this assessment, TSC has reviewed and incorporated into this report the pertinent information resulting from the following efforts:

- A Search and Review of Public and Private Sector Programs,
- Identification and Review of Existing Data Banks (Materials and Accident Statistics),
- Identification and Review of Existing Regulations Standards, Specifications, and Guidelines. (Authors)

Note: This reference supplements the present bibliography by furnishing information on on-going projects which have not yet culminated in published reports.



Ref. No.: A 8

Safety Categories: 3,4

Title: An Assessment of the Crashworthi-  
ness of Existing Urban Rail Vehic-  
les. Vol. I: Analyses and Assess-  
ments of Vehicles, Chapters 1-7.  
Vol. II: Analyses and Assessments  
of Vehicles, Chapters 8-12 plus  
Appendices and References. Vol III:  
Train-Collision Model Users' Manual

Date: Nov 1975

Source: NTIS, Order Nos.  
PB-249 141/SET and PB-254  
695/AS

Author: R.J. Cassidy, D.J. Romeo

Organization: Calspan Corp.

Sponsor: TSC for UMTA

The crashworthiness of existing urban rail vehicles (passenger cars) and the feasibility of improvements in this area were investigated by Calspan Corporation under UMTA's Urban Rail Supporting Technology Program. Both rail-car structural configurations and impact absorption devices were studied. From this work, recommendations for engineering standards for urban rail vehicles will be developed.

This final report issued under the crashworthiness effort covers:

1. The development of analytical tools to predict passenger threat-environment during collision.
2. Criteria for predicting passenger injury due to train collisions.
3. An application of injury criteria and analytic models to predict passenger injuries resulting from collisions of trains that represent existing construction types.
4. A preliminary investigation of applying impact absorption devices to transit vehicles.
5. A design study of car structural configurations for improved impact energy management.
6. A review of engineering standards for Urban Rail Car Crashworthiness.

(Abstract by the Author)

Ref. No.: A 9

Safety Categories: 1

Title: Assessment Of The Risks Associated  
With The Use Of Carbon Fibers In  
Surface Transportation

Date: June 1980

Source: NTIS, Report No.  
PB-80-208 309

Author: W.T. Hathaway, K.M. Hergenrother,  
C. E. Bogner

Organization: TSC

Sponsor: RSPA

This report presents the results of an assessment of the potential risks associated with the use of carbon-fiber composites in the surface transportation system and the development of a data base on the vulnerability of the surface transportation system to airborne carbon fibers. In conducting the risk assessment, TSC estimated the potential usage of carbon-fiber composites in surface transportation, the frequency and severity of vehicle fires and the expected carbon-fiber release from the composite in a fire. In developing the data base on the vulnerability, TSC reviewed and analyzed the electrical and electronic systems present in the various surface-transportation modes. (Authors)

Note: The vulnerability of electrified rail systems is discussed in Section 4.2.2 of this comprehensive report.

Ref. No.: \*A 10

Safety Categories: 3,10

Title: The A.T.C. and A.P.B. Systems in  
Automatic Train Running

Date: Oct 1975

Los Sistemas A.T.C. y A.P.B. en  
la Conduccion Automatica de Trenes

Source: Asociacion de  
Investigacion del Trans-  
porte (AIT) (Madrid Spain)  
Oct 1975 p. 4

Author: M. Lebrun

Organization: Societe Alsthon

Sponsor: NA

The author offers descriptions of the Societe Alsthom's Absolute Permissive Blocking (A.P.B.) symmetrical signalling system and the S.C.A.R. safety system. Continuous track circuits act as the primary component in the A.P.B. signalling system. The S.C.A.R. (Systeme de Conduite Automatique par Rapport a la Vitesse, Ltd.) safety system was developed for the Lyons Underground.

The article is written in Spanish, with no English summary.

Ref. No.: A 11

Safety Categories: 3

Title: At-Grade Crossings of Light  
Rail Transit (Abridgement)

Date: 1977

Source: TRB, Research  
Record No. 627, pp. 7-10

Author: D. Morag

Organization: DeLeuw, Cather and Co.

Sponsor: NA

The methodology and lane capacity estimate developed in this paper are designed to aid the transportation planner in the analysis of traffic impact due to the implementation of semiexclusive LRT lines. This type of analysis may provide the 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 that was estimated at the time of the analysis would exceed the crossing capacity, the additional ROW for crossing improvement was unavailable or too costly, or totally grade-separated intersection 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 consist operation at high service frequencies, locating transit stops at grade-crossing approaches is desirable to reduce traffic impact.

However, this analysis considered only independent at-grade crossing situations, and additional considerations would be required to analyze the impact of at-grade crossings on adjacent intersections with signals. These intersections may require synchronization with the preempted crossing protection system. (Author)

Ref. No.: \*A 12

Safety Categories: 3,10

Title: Automatic Control of Trackbound  
Vehicles

Date: Mar 1977

Source: Electrical Communication,  
Vol. 52, No. 4, Mar 1977,  
pp. 279-282

Author: H. Uebel

Organization: NA

Sponsor: NA

Increased railway safety can be achieved by using modern electronic control techniques, such as the SELTRAC system for urban transport systems. Onboard equipment for this system has been undergoing trials in Berlin. The control center transmits data such as expected position, maximum permissible speed, and recommended speed to the vehicle and the onboard control system compares this with the measured values. Any discrepancies are corrected by forwarding control signals to the speed control or braking systems. The paper deals with the techniques and especially the safety factors involved. (EIA)

The article is written in English.



Ref. No.: A 13

Safety Categories: 4

Title: Automatic Couplings Speed  
Transit Turnarounds

Date: Nov 1977

Source: International  
Railway Journal,  
Nov 1977, p. 62

Author: International Railway Journal

Organization: Bergische Stahl-Industrie

Sponsor: NA

This one page article describes an automatic coupling device developed by Bergische Stahl-Industrie (BSI) for rapid transit vehicles. The BSI compact automatic centre buffer coupling is also designed to act as a impact absorber.

Ref. No.: \*A 14

Safety Categories: 3,10

Title: An Automatic Operating System for  
the Rhein-Ruhr Urban Rail System

Date: Sep 10, 1978

Automatisches Betriebsfuehrungssystem  
der Stadtdahn Rhein-Ruhr

Source: Internationales  
Verkehrswesen, Vol. 30, No. 5,  
Sep 10, 1978, pp. 322-327

Author: J. Linder

Organization: NA

Sponsor: NA

The automatic operating system of the Rhine-Ruhr railway is part of an integrated technical operating system for extensive automation of the many functions of a rapid transit railway. Commencing with a strictly hierarchical classification of the overall function according to the disposition of the operations, the running of the operation, operational safety and the appropriate central functions, the system is described together with that of the hierarchically classified system of process computers for carrying out especially important sub-functions. These components of the system provide the automation for operating signal boxes and the provision of information on the operational situation for the supervision and control of the rail traffic. In addition they support the central station supervision and provide passengers there with information. Following the initial realisation of the system on the urban railway model stretch Essen-Mulheim the concept of the system extended since will also include central remote control of signals using data-processing technology. To fulfill this task, there are, in view of the safety problems related to this, engineering problems of a special type which have to be overcome. (RRIS)

The article is written in German, with no English summary.

Ref. No.: A 15

Safety Categories: 3,10

Title: Automatic Train Control for Rail  
Rapid Transit

Date: June 22-24, 1977

Source: IEEE, Proceedings of  
Joint Automatic Control  
Conference, San Francisco,  
June 22-24, 1977, pp. 481-488

Author: R. E. Goodson

Organization: Purdue University

Sponsor: NA

Most ... rail rapid transit systems operate on a block signal approach for the basic train detection and protection system. This block system is described and two laws implicitly used in a control system are discussed. It is shown that these two laws are used as the basis for the hierarchical control system concept. Automatic train control systems are described for several current rail systems. References are discussed which indicate the future of this technology and the research areas which need to be pursued.  
(Author)

Ref. No.: A 16

Safety Categories: 3,10

Title: Automatic Train Control in  
Rail Rapid Transit

Date: May 1976

Source: NTIS, Order No.  
OTA-T-30-18

Author: U.S. Congress, Office of  
Technology Assessment

Organization: Same

Sponsor: NA

This report is an evaluation of U.S. systems' operational experience with Automatic Train Control (ATC) in terms of safety, performance, and cost. ATC includes Automatic Train Operation (ATO), Automatic Train Supervision (ATS), and Automatic Train Protection (ATP).

Much of this report is devoted to describing ATC systems and other types of train control systems in use on existing RRT systems. It also describes plans for ATC by WMATA, MARTA, and Baltimore systems and compares safety data from ATC and non-ATC systems.

Safety-related findings:

1. ATP (train separation, overspeed protection, route interlocking) has a clear safety advantage over human control. Human error, particularly misjudging separation, was a factor in all collisions and most of the derailments that occurred between 1965 and 1974.
2. Passenger injury rates are no different for automatic and human control systems.
3. Most passenger injuries are not related to train operation.

Note: The report gives a clear, non-technical description of how ATC works and what it is used for. The data analysis section includes comments on limitations of the data base.

Ref. No.: \*A 17

Safety Categories: 3,10

Title: Automation and Safety Operation  
of Metropolitan Railways Based on  
High Tension Impulse Track Circuits

Date: Oct 1975

Source: Rail Engineering  
International, Oct 1975,  
pp. 272-275

Author: M. Davy

Organization: Jeumont - Schneider

Sponsor: NA

The Montreal Metro in Canada and the Marseille Metro in France use a train control system developed by Jeumont-Schneider. This control system can be linked singly or in combinations to a variety of self-contained functional components. Track circuits provide the operating medium, using both high and low current frequencies for signalling. The self-contained characteristic of the system's modular composition allows any individual subassembly to fail safely. This article explains the safety application of the impulse insulated-joint track circuits, which are key to the successful operation of this train control system.

The article is written in English.



Ref. No.: \*B 1

Safety Categories: 3,5,8

Title: BART Nears the End of the Long  
Haul

Date: Jan 1978

Source: Railway Gazette  
International, Vol. 134,  
No. 1, Jan 1978, pp. 17-20

Author: F. C. Herringer

Organization: BART

Sponsor: NA

Bay Area Rapid Transit is striving for a reliability that will permit full-time operation. Problems are identified as train performance planned beyond physical limits and attempts to innovate in too many areas simultaneously without planning for adequate system performance when inevitable equipment failures occurred. Strengthened maintenance techniques and engineering efforts are improving car availability. Problems with the automatic train control have been compounded by the need to resignal the entire network for lower rates of deceleration than originally designed. The evolution of the automatic train protection system is described. (RRIS)

The article is written in English.

Ref. No.: B 2

Safety Categories: 1,3,10

Title: BART - The Road is Still Bumpy,  
but the Goal is in Sight

Date: Nov 12, 1979

Source: Railway Age,  
Vol. 180, No. 21,  
Nov. 12, 1979

Author: W. D. Middleton

Organization: Railway Age

Sponsor: NA

While its most protracted labor dispute was taking place, Bay Area Rapid Transit was actively working to improve reliability, safety, and capacity. In the wake of its tunnel fire, BART is investigating new types of seat upholstery and ways to inhibit the spread of flames and smoke in its cars and tunnels. Improvements in brake and traction components are to increase car availability. A Sequential Occupancy Release System is to supplement the original automatic train control to permit closer headways and cab signals will permit full-speed operation in cases of some central control failures. Fare gates are also being improved. Ahead will be additional track capacity and new computers which will be adjuncts to a completely new control system. (RRIS)

Ref. No.: B 3

Safety Categories: 3,10

Title: A Baseline Automatic Train  
Control System Incorporating  
System Assurance Considerations

Date: undated

Source: General Railway  
Signal Co., GRS and West  
Ave. Rochester, NY 14602

Author: J. O'Neill

Organization: General Railway Signal Co.

Sponsor: NA

Agencies responsible for rail transit projects are increasingly aware of the area of system assurance, including reliability, maintainability and safety. Specifications call for the contractors to include system assurance programs establishing objectives, with supporting organization, procedures and documentation. This recognizes the contribution of system assurance in determining quality of service offered. Recently this thinking has been extended to a conceptual command and control system for a rapid transit system. The conceptual system is a baseline from which final performance and hardware specifications could be developed after analysis of variations therefrom. The baseline system permits automatic operation and takes advantage of the facts that acceptable performance can be achieved without an excessive number of commands, and that recent developments in rail insulated joints offer high reliability of insulated track circuits. This permits use of power-frequency track circuits modulated by a limited number of command codes. The result is a relatively low system component count and reduction in active elements, factors with favorable impact on system availability. Principal command and control functions included in the baseline system, and subjected to system assurance analysis, include vehicle direction, speed, train separation, station stopping profile, platform positioning, door control, station dwell time, and train to wayside communication. Analysis indicates configuration variations are possible which could appreciably increase the estimate of mean time between failure while maintaining fail-safe standards of baseline system. (Author)

Ref. No.: \*B 4

Safety Categories: 1,3,6,8

Title: The Brussels Metro

Date: Apr 1976

Source: U.I.T.P. Revue,  
Apr 1976, p. 256.

Author: P. Appelmans

Organization: Societe des Transports  
Intercommunaux de Bruxelles (STIB)

Sponsor: NA

Officials of the STIB have written descriptions of the various areas of the Brussels mass transit system. Mr. Hancoq, the director of the rolling stock division, discusses the safety devices included in the design of the rolling stock. The development of the vehicle is the result of an ergonomic study conducted by the STIB. Mr. Woitchik, the director of Special Studies division of the STIB, explains the safety precautions included in the design of the system. General descriptions of the safety system for electric power, the fire protection measures, and the traffic safety signalling equipment are contained in his segment of the article.

The paper is written in English.

Ref. No. C 1

Safety Categories: 8

Title: Characteristics of Urban Transportation Systems - A Handbook for Transportation Planners

Date: June 1979

Source: NTIS, Order No.  
PB-310 319/OST

Author: D. B. Sanders, T. A. Reynen

Organization: De Leuw, Cather and Co.  
165 Wacker Drive  
Chicago, Ill. 60601

Sponsors: UMTA, FHWA

The .... handbook to be used by transportation planners and urban specialists for estimating system parameters for conventional transportation technology. Three modes are evaluated: rail transit, local bus and rapid transit, and highway systems. Each mode contains an assessment of the following seven selected supply parameters: speed, capacity, operating cost, energy consumption, pollutant emissions, capital costs, and accident frequency. These parameters are organized as proxy variables in describing the characteristics of each transport mode. (Authors)



Ref. No.: \*C 2

Safety Categories: 8,10

Title: Charting the Limits of  
Unmanned Operation

Date: Oct 1975

Source: Railway Gazette Inter-  
national Vol. 131, No. 10,  
Oct 1975, pp. 373-377

Author: H. Tappert

Organization: Hamburger Hochbahn AG

Sponsor: NA

Introduction of full automation of rapid transit does require a radical change of views in which there can be no shrinking from technical, operating and legal challenges. Today's automation technology does allow rapid transit systems to be run with very few employees. Use of trains without operators and stations without attendants does not jeopardize safety, but in some cases improves it. Attractiveness of service can be improved at little expense. The author has described his efforts at automating West Germany's Hamburg transit system. (RRIS)

The article is written in English.

Ref. No.: C 3

Safety Categories: 1

Title: Commonalities in Transportation  
Fire Safety: Regulations, Research  
and Development, and Data Bases

Date: Nov 1980

Source: NTIS

Author: W.T. Hathaway

Organization: TSC

Sponsor: RSPA

This report presents a comprehensive review of current modal fire safety efforts within the U.S. Department of Transportation. Common fire safety problems and modal administration response are identified. Work completed includes the following:

1. A review of modal administration fire regulations for extent of coverage and commonalities.
2. A review of modal administration fire research and development projects to determine commonalities of purpose and interest in current projects which either support or suggest revisions of existing regulations, or in some instances, suggest promulgation of new regulations.
3. A survey of statistical fire/accident data bases to determine the availability of transportation fire statistics and the commonalities of these data bases. (Author)

Ref. No.: C 4

Safety Categories: 3

Title: The Common Right-of-Way Problem

Date: Oct 17-21, 1977

Source: System Safety Society,  
Third International System  
Safety Conference Pro-  
ceedings, 1977, pp. 671-688

Author: H. E. Roland

Organization: Safety Department, Insti-  
tute of Safety and Systems  
Management, University of  
Southern California

Sponsor: NA

The paper presents a quantitative analysis of the risk involved in having Rail Rapid Transit systems share a right-of-way with an existing railroad. The author calculates the probability that collisions or derailments on one right-of-way (either transit or railroad) will cause a collision on the other right-of-way. He then calculates the extent to which countermeasures are justified. The methodology presented may be used to determine acceptable risk levels and countermeasures for common right-of-ways.

Ref. No.: \*C 5

Safety Categories: 10

Title: Computer Application in Rapid  
Transit

Date: Jan 5, 1979

Source: Institution of Railway  
Signal Engineers, 1 Ashbourne  
Close, London, W5, England

Author: NA

Organization: Institution of Railway  
Signal Engineers

Sponsor: NA

The report comprises four articles on the systems and up-to-date installations on the four following metropolitan railways; Hong Kong, Paris (RATP), Atlanta (MARTA) and London (London Transport). (RRIS Abstract)

The report is written in English.

Ref. No.: \*C 6

Safety Categories: 3,10

Title: Computerized Interlocking System  
- A Multi-dimensional Structure  
In The Pursuit of Safety

Date: Nov 1978

Source: Railway Engineer  
International, Vol. 3, No. 6,  
Nov 1978, pp. 29-30

Author: B. J. Sterner

Organization: NA

Sponsor: NA

An analysis of safety in automatic signalling, by focusing on system structure. A computerized interlocking system provided the data base used in this analysis.

The paper is written in English.



Ref. No.: C 7

Safety Categories: 3,10

Title: Computer Network to Monitor  
Atlanta Rapid Transit System

Date: Oct 1977

Source: Instrumentation  
Technology, Vol. 24,  
No. 10 Oct 1977, p. 11

Author: Instrumentation Technology

Organization: Same

Sponsor: NA

This is a half-page description of the centralized dispatching and performance monitoring computer network planned for the Atlanta Rapid Rail Transit System.

"Safety is the highest priority in the transit system design. Each station will contain a small display panel representing trackwork and train activity within the station control area, and will provide panel equipment for manual control of routes and speeds for supervisory backup. Each train operator may verbally communicate with Central Control, and will have the ability either to control the train completely, or manually start it, but let it accelerate and stop automatically. In addition, the operator may switch to a lower or higher performance level for schedule changes." (Paragraph 8 of article).

Ref. No.: \*C 8

Safety Categories: 1

Title: Counter-Measures Against Fire  
in Subway Stations (Part 2)

Date: May 1976

Source: Japanese Association of Fire Science and Engineering, Vol. 23, No. 5.

Author: Japanese Association of  
Fire Science and Engineering  
(105 Investigation Committee)

Organization: Same

Sponsor: NA

The facts associated with fire and fume incidents in six subway systems provided the data base used by the J.A.F.S.E. to develop effective counter-measures against subway fires. An investigation centered around fires in vehicles, electrical facilities, station facilities, and tunnels. An account of the investigation is given in several tables.

Note: Part 1 of this report describes the subway layout and is not directly applicable to the general subject of safety.

The article is written in Japanese, with no English summary.

Ref. No.: C 9

Safety Categories: 4, 6

Title: Crashworthiness Analysis of the  
UMTA State-of-the-Art Cars

Date: Oct 1975

Source: NTIS, Order No.  
PB-247 230/6ST

Author: E. Widmayer, A.E. Tanner,  
R. Klump

Organization: Boeing Vertol

Sponsor: TSC for UMTA

An engineering assessment of the crashworthiness of the UMTA State-of-the-Art Car (SOAC) has been conducted as part of a program to provide safer transportation to urban rail vehicles. Crash dynamics and crashworthiness methodology based on post-yield energy absorption characteristics and a "weighted acceleration" severity index has been applied. Sensitivity studies have been conducted to show the effect of car buff strength, passenger relative velocity, passenger spacing, and cushioning on casualties as defined by the severity index. Major gains in injury reduction through improved internal cushioning are indicated. The prevention of car penetration by override is treated. The SOAC collision dynamics model is validated by comparison to the SOAC-gondola accident of August 11, 1973, and by comparison to a nonlinear finite element mathematical simulation of the SOAC in crash conditions. (Author)

Ref. No.: D 1

Safety Categories: 3

Title: Design of a Metal Skinning Energy  
Absorber for the US Capitol  
Subway System

Date: Oct 1977

Source: International  
Journal of Mechanical  
Sciences, Vol. 19, No. 10,  
Oct 1977, pp. 595-602

Author: J. A. Kirk

Organization: Maryland University

Sponsor: NA

A metal cutting energy absorber system has been designed for the U.S. Capitol Building Rayburn House Subway System (not part of WMATA). The design, utilizing a round bar which is pulled through a circular cutting tool, applies a constant retarding force to the subway vehicle.

Ref. No.: \*D 2

Safety Categories: 3,10

Title: Design Philosophies in Automatic Train Control

Date: Oct 1975

Source: Railway Gazette International, Vol. 131, No. 10  
Oct 1975, pp. 377-382

Author: J. E. Freehafer

Organization: General Railway Signal Co.

Sponsor: NA

Two broad categories of automatic control have emerged in 15 years of rapid transit automation, identified by use of track circuits or separate conductors for the ground-to-train communications channel. Continental Europe has favored a wide-band link which gives flexibility in allocating functions to lineside and on-train equipment, but places heavy reliance on reliability of electronic logic. North American practice, represented by the Washington Metro, is to build up a control hierarchy from elements which can function independently in the event of failure. (RRIS)

The article is written in English.



Ref. No.: \*D 3

Safety Categories: 1

Title: Development of a Code of  
Practice for the Use of all  
Flammable Materials in the  
London Underground

Date: May 3-5, 1979

Source: U.I.T.P., Inter-  
national Subway Committee  
Meeting Proceedings,  
Stockholm, May 3-5, 1979

Author: London Transport Executive

Organization: Same

Sponsor: NA

This paper, presented to the 1979 Stockholm meeting of the UITP Working Group for the Protection of Electrical Cables Used in Undergrounds, emphasizes the need for realistic testing of materials for smoke and fume emissions. It is stated that laboratory testing does not give an accurate indication of how materials react in real life situations. The paper cites the major factors which should be examined in testing materials and in approving newly designed railway equipment.

The paper is written in English.

Ref. No.: D 4

Safety Categories: 1

Title: Directory of DOT Fire Research,  
1979 Edition

Date: Dec 1980

Source: NTIS, Report No.  
PB-81-156 598

Author: W.T. Hathaway, S.H. Markos

Organization: TSC

Sponsor: RSPA

This document presents the results of a survey of the fire safety projects conducted by the modal administration of the U.S. Department of Transportation. Ongoing and recently completed modal fire safety projects for the period June 1978 to December 1979 are identified and presented. This survey updates project information previously contained in the report "Assessment of Current U.S. Department of Transportation Fire Safety Efforts," July 1979. (Authors)

Ref. No.: \*D 5

Safety Categories: 6

Title: Door Locking System for Passenger  
Coaches

Date: Dec 1979

Source: Glaser's Annalen ZEV  
Vol. 103, No. 12, Dec 1979,  
pp. 430-434

Author: H. L. Manson

Organization: British Railways

Sponsor: NA

Locking of passenger coach doors against inadvertent or intentional opening during running has been decisively improved during recent years. The most important improvement involves the introduction of an electromagnetic door locking system which has been installed as a standard feature on rapid transit vehicles since 1971 and on express train coaches since 1976. Retrofitting programmes for older coaches are presently under way in combination with a centralized door closing facility. This system affords an almost absolute protection of the passenger against falling from a running train. Following an introductory analysis of the causes of accidents and a description of previous safety precautions, the paper describes the design and performance of the electromagnetic door locking system for double hinged doors and hinged sliding doors. (RRIS)

The article is written in English.

Ref. No.: \*E 1

Safety Categories: 1

Title: Edmonton's North East Light  
Rail Rapid Transit Line

Date: June 1978

Source: Alberta University,  
89th Ave. and 114th St.,  
Edmonton, Canada (Light Rail  
Conference Proceedings,  
June 1978)

Author: Alberta University  
Edmonton, Canada

Organization: Same

Sponsor: NA

Fourteen papers discuss various aspects of the light rail system installed in Alberta's capital city. Papers explaining the safety systems and fire protection measures are included.

The papers are written in English.

Ref. No.: E 2

Safety Categories: 1

Title: Electrical Insulation Fire  
Characteristics  
Vol. I: Flammability Tests

Date: Dec 1978

Source: NTIS, Order No.  
PB-294 840/4WT

Author: L. E. Meyer, A. M. Taylor,  
J. A. York

Organization: Boeing Commercial Airplane Company

Sponsor: TSC for UMTA

The results of work conducted under DOT/TSC contract #1221 are presented. Standard flammability, smoke emission, and circuit integrity tests were developed for electrical wire and cable insulating materials used in rapid transit system vehicles and wayside installations. Wire and cable insulating materials presently in use on rapid transit systems and newer polymeric materials proposed for such systems were tested and ranked with respect to their performance during the tests. Also presented is a discussion of the need for such standard tests, the criteria for the selection of a test method, the development of the test details, and a description of the standard tests. (Authors)



Ref. No.: E 3

Safety Categories: 1

Title: Electrical Insulation Fire  
Characteristics  
Vol. II: Toxicity

Date: Dec 1978

Source: NTIS, Order No.  
PB-294 841/2WT

Author: C. R. Crane, D. C. Sanders,  
B. R. Endecott, J. K. Abbott

Organization: Civil Aeromedical Institute  
Federal Aviation Administration  
Oklahoma City, OK. 73125

Sponsor: TSC for UMTA

The relative toxicities of the combustion products of 14 electrical wiring insulations were evaluated using animal incapacitation as a measure of toxicity. One-gram insulation samples were pyrolyzed in a quartz combustion tube connected in-line with a 12.6-L-exposure chamber by an air recirculation assembly to form a closed exposure system. Each material was pyrolyzed under three thermal degradation conditions, and the time-to-incapacitation for the "worst case" condition (shortest time) was used to rank the materials in order of their relative potential toxicity. A rank order for all 14 materials is presented on the basis of potential toxicity for equal weights of insulation; relative ranking by toxicity for equal lengths of conductor is presented for those materials supplied on conductors of equal gauge. Techniques are suggested for converting measured toxicity of an insulation or wire of one size to the equivalent toxicity of the same insulation or wire of a different size. (Authors)

Ref. No.: E 4

Safety Categories: 3,4

Title: Energy Absorbing Bumping Posts

Date: May 1978

Source: Progressive  
Railroading, Vol. 21,  
No. 5, May 1978,  
pp. 71-72

Author: Progressive Railroading

Organization: NA

Sponsor: NA

Friction-type bumpers, designed to yield on impact with a progressive rate of retardation, have been tested by the New York City Transit Authority. The German-developed units are of varying designs including models for dead-end passenger terminal tracks. (RRIS)

Ref. No.: E 5

Safety Categories: 2

Title: Evacuation and Rescue in Automated Guideway Transit  
Date: Dec 1979  
Vol. I: Data Collection, Scenarios and Evaluation  
Vol. II: Guidebook

Source: NTIS, Order Nos.  
PB80-195 761 for Vol. I  
PB80-195 779 for Vol. II

Author: D. E. Benjamin

Organization: Vought Corporation  
Dallas, Texas

Sponsor: UMTA, Office of Technology  
Development and Deployment

Evacuation and rescue are significant problems in all transportation systems. Serious injuries and loss of life can result from situations in which inadequate means of evacuating and rescuing passengers exist. In conventional transportation systems, transportation personnel can help to evacuate and rescue passengers. AGT systems, however, present a number of special evacuation problems because they are highly automated systems. Operation of AGT systems with elevated guideways also presents significant problems.

Volume I describes the methodology used in developing evacuation and rescue guidelines. Volume II is a Guidebook to evacuation and rescue intended for use by AGT planners, designers and decision makers. (From author's abstracts).

Ref. No.: E 6

Safety Categories: 3,6,10

Title: Evaluation of Signal/Control System Date: Dec 1978  
Equipment and Technology.  
Task I: Assessment of Signal/Control  
Technology and Literature Review

Source: NTIS, Report No.  
PB-296 494

Author: S.F. Taylor, J.F. Marshall,  
C.M. Schultz, R.B. Whalen

Organization: STV, Inc.; Dyer (Thomas K.), Inc.

Sponsor: FRA

The report presents the results of an investigation to obtain an assessment of the present technologies in use throughout the world for railroad signals and control systems applicable to high-speed passenger trains. Questionnaires were developed and sent to foreign and domestic railroads, rapid transit systems, and manufacturers of signal and control equipment. Railroads, transit systems and manufacturers were visited and interviewed. Many hundreds of articles and technical papers were researched. Over 250 were cataloged, translated and cross-indexed to form a complete technical library. This inventory data has been arranged to permit a logical review of all known technology in relation to each type of railroad signal or control system or subsystem(s). (Authors)

Ref. No.: E 7

Safety Categories: 3, 8

Title: Expansion of System Safety  
Program Planning to the Railroad  
Industry: Signal Applications

Date: Oct 17-21, 1977

Source: Third International  
System Safety Conference  
Proceedings, Oct 17-21, 1977  
(System Safety Society)  
pp. 657-664

Author: P. J. S. McNenny

Organization: General Railway Signal Co.

Sponsor: NA

The article discusses different types of system safety analysis techniques in terms of their appropriateness for railroads and mass transit. It describes safety requirements and elaborates on how these requirements may be quantified.



Ref. No. \*E 8

Safety Categories: 3,10

Title: Experimental Railway Signalling  
System Using Microprocessors

Date: Sep 26-28, 1977

Source: Institute of  
Electrical Engineers,  
London, England, IEE  
Conf. Publ. No. 153,  
Intl. Conf. on Distri-  
buted Computer Control  
Systems, Birmingham,  
England, Sep. 26-28,  
1977

Author: A. H. Cribbens, M. J. Furniss,  
H. A. Ryland

Organization: British Railway Board

Sponsor: Same

Conventional railway signalling technology has been developed to provide the railway operator with a system which is both extremely safe and acceptably reliable. Any radical departure from present methods, therefore, must be not only cost effective, but must be capable of being engineered to suitably high standards, and must meet the safety, reliability, and maintainability requirements. Within the constraint that it is desired to retain the basic form of present day railway signalling systems, a number of opportunities exist for the use of new technology. The work described in this paper is aimed at the replacement by modern electronic technology of the large part of the system concerned intimately with safety. There is no intention at this stage to propose changes to the appearance and behavior of the system as seen by the operating staff. (Authors)

The paper is written in English.

Ref. No.: \*F 1

Safety Categories: 10

Title: Fail-Safe Data Processing in Railway Signalling Systems

Date: Nov 1978

Source: Siemens Research and Development Reports,  
Vol. 7, No. 6, Nov. 1978  
pp. 374-377

Author: H. J. Lohmann

Organization: Siemens (Braunschweig, Germany)

Sponsor: NA

Data processing systems intended for use in railway signalling systems have to meet high standards so that any failure which may occur will never lead to a hazardous situation. This means that they must effectively inhibit further operation whenever any failure occurs. In the fail-safe microcomputer system SIMIS this is realized through the use of special output signal converters which only pass the output signals of two autonomous microcomputers if the results of signal processing are fully consistent. When a comparator detects an error it halts the processing cycle, thereby inhibiting further operation. (Author)

The article is available in either German or English.

Ref. No.: F 2

Safety Categories: 1

Title: Fire Blackens BART Image

Date: July 1979

Source: Mass Transit,  
Vol.6, No. 7, July 1979, p. 12

Author: H. E. Demoro

Organization: Mass Transit

Sponsor: NA

A loose equipment cover that fell from beneath a Bay Area Rapid Transit train and damaged the third rail in the Transbay Tube stalled and damaged a subsequent train that then caught fire in the 3.8 mile tunnel. The emergency procedures of BART and city fire departments proved inadequate as the seven cars were destroyed or damaged by the fire. Recounted are the events of January 17-18, 1979, as well as subsequent investigations while the most important segment of BART was shut down for 2.5 months. (RRIS)

Ref. No.: F 3

Safety Categories: 1

Title: Fire Hazard Evaluation of BART  
Vehicles

Date: Mar 1978

Source: NTIS, Order No.  
PB-281 383/OST

Author: E. Braun

Organization: National Bureau of Standards  
Center for Fire Research,  
Washington, D.C. 20234

Sponsor: UMTA

A fire hazard evaluation was performed of the subway cars used on the San Francisco Bay Area Rapid Transit District. After analyzing the cars' interior and exterior design, five recommendations were made which, if implemented, would improve passenger safety by decreasing the probability of developing a hazardous fire situation. Among these recommendations were the upgrading of current upholstered urethane seat assemblies and the need for the development of a fire detection system appropriate for rapid rail transit vehicles. Those system improvements would not only provide passengers a safer traveling environment but would also provide a modest level of protection for the heavy investment in rail vehicles. (Author)

Ref. No.: \*F 4

Safety Categories: 1

Title: Fire Hazard Evaluation of  
Cables and Materials

Date: Nov 18-20, 1975

Source: 24th Annual Inter-  
national Wire and Cable  
Symposium Proceedings,  
Nov 18-20, 1975

Author: E.J. Gouldson, G.R. Woolerton,  
J.A. Checkland

Organization: North Electric Company,  
Montreal

Sponsor: NA

Test methods currently used for testing cables and cable materials are discussed and improved techniques are proposed. The virtues of the proposed techniques are illustrated by means of a typical fire retardant cable compound development. Finally the concept of a fire hazard rating system is introduced as a rationalization of the interpretation of cable and materials flammability testing. (Authors)

The paper is written in English.



Ref. No.: F 5

Safety Categories: 1

Title: A Fire Hazard Evaluation of the  
Interior of WMATA Metrorail Cars

Date: Dec 1975

Source: NTIS, Order No.  
PB-249 776/6ST

Author: E. Braun

Organization: National Bureau of  
Standards, Center for Fire  
Research

Sponsor: WMATA

A series of fire tests was conducted for the Washington Metropolitan Area Transit Authority to assist them in assessing the potential for fire hazard in the new Metrorail subway cars. Results of small-scale laboratory tests were found inadequate for this assessment. Results of full-scale tests on mock-ups of the interior (and on a real car for a smoke penetration test) show that the potential for hazard arises primarily from the seat padding and covering and from the plastic wall lining. The hazard arises both from smoke development and from spread of flame and heat. The times to reach unacceptable conditions have been determined for several test conditions. It is recommended that the authorities review these times in the context of what they consider to be appropriate times for safe escape. Recommendations are made for increasing the amount of time available for escape. These would require changes in the seating and wall lining materials. (Author)

Ref. No.: \*F 6

Safety Categories: 1,2

Title: Fire In Rapid Transit  
Tunnels

Date: Mar 19-21, 1979

Source: . Third International  
Symposium on the Aerodynamics  
and Ventilation of Vehicle  
Tunnels, Mar 19-21, 1979  
(BHRA Fluid Engineering,  
Cranfield, Bedford,  
England) p. 427

Author: I.J. Cockram

Organization: London Transport Executive

Sponsor: NA

This paper is concerned with the removal of smoke in tunnels during fires. The emphasis is on the development of an efficient and safe method of managing fire-related incidents in tunnels that does not rely totally on electronic equipment. The author discusses operational procedures during fires with attention to passenger evacuation, liaison with emergency services, incident location, and smoke removal methods. Attention was also given to precautionary measures that ensure the proper functioning of smoke and fire control equipment.

The paper is written in English.

Ref. No.: \*F 7

Safety Categories: 1,2,8

Title: Fire Prevention and Rescue  
Work in the Metro

Date: Apr 1979

Source: Metro Committee  
of the City of Helsinki  
(p. 46 of brochure "The  
Helsinki Metro," Apr 1979)

Author: Metro Committee of the  
City of Helsinki

Organization: Same

Sponsor: NA

The Helsinki Metro has been under construction since 1969, and 1982 is the planned opening date for the first line. Fire prevention and passenger safety were strongly considered when designing this system. Tunnel evacuations are made easier by the short distances between stations and the highly visible signs placed in the tunnels. The width of the parallel rock tunnels is over three hundred feet. The tunnels will have a dual lighting system; one will be operated only during emergency situations and the other will be used during normal operation. Both emergency telephones and water pipes with hydrants will be placed in the tunnels. Every station will have an emergency exit and a dual lighting system. Sprinklers will be located at the main entrances of the stations.

The brochure is printed in English, German and French.

Ref. No.: \*F 8

Safety Categories: 1,8

Title: Fire Prevention: Electrical  
Cables

Date: May 3-5, 1979

Source: U.I.T.P., Inter-  
national Subway Committee  
Meeting Proceedings,  
Stockholm, May 3-5, 1979

Author: G. Donato

Organization: Montreal Urban Community  
Transit Commission

Sponsor: NA

This paper contains descriptions of the training programs required for different levels of employees working in the MUTC subway system. An outline of how the fire prevention division functions is given in this paper. The appendix contains statistical data relating to the number of personnel trained in fire safety methods, the location and causes of the sixty-seven fires that took place within the system during 1978, and the types and number of fire-fighting equipment. The paper is more general, and more training oriented, than the title would indicate.

The paper is written in English.

Ref. No.: \*F 9

Safety Categories: 1,7

Title: Fire Prevention Facilities at  
The Kesei-Ueno Station

Date: Feb 1977

Source: Denryoku to Tetsudo,  
Vol. 27, No. 2, 1977

Author: H. Yoshinari

Organization: NA

Sponsor: NA

The Kesei-Ueno Station was extensively remodeled during the four year period between June 1972 and July 1976. The fire prevention measures incorporated are described in this article. The exit-indication lighting, the indoor fire hydrants, the fire prevention panel, the halogen fire extinguishing devices, the smoke exhaustion apparatus and the emergency illumination system are among the precautionary measures described in this paper.

The article is written in Japanese, with no English summary.



Ref. No.: \*F 10

Safety Categories: 1,2

Title: Fire Prevention Facility for  
The Longest Tunnel of The New  
Tohoku Line

Date: Feb 1977

Source: Denryoku to Tetsudo,  
Vol. 27, No. 2, 1977.

Author: M. Kitagawa

Organization: NA

Sponsor: NA

Guaranteeing a source of power and illumination for safe passenger evacuation during train fires in tunnels, is the primary focus of this article. Smoke emissions have a tendency to cause poor visibility, especially in tunnels, thus making evacuation conditions ripe for passenger panic. The Tohoku line's longest tunnel has a double wiring system to ensure against power failure during incidents of fire in tunnels. This article contains an explanation of the installation and the equipment used in this safety-oriented lighting system.

The article is written in Japanese, with no English summary.

Ref. No.: F 11

Safety Categories: 1

Title: Fire Protection Systems on WMATA  
Metro

Date: Jan 1978

Source: ASCE Journal of  
Transportation Engineering,  
Vol. 104, No. 1, Jan 1978,  
pp. 69-74

Author: W. M. Ell

Organization: DeLew, Cather, and Co.

Sponsor: WMATA

To provide safe passenger egress in case of fire, a fire protection system requires at least the following equipment or subsystems:

1. Smoke and fire detection
2. Fire alarm
3. Fire fighting

This article describes how the automatic detection and fire fighting aspects of the WMATA fire protection system were designed into the system. It gives an overview of the considerations that went into the final decisions.

Ref. No.: F 12

Safety Categories: 1

Title: Fire Remains A Big Potential Hazard Date: May 1980

Source: International Railway Journal, Vol. 20, No. 5, May, 1980, p. 47

Author: International Railway Journal

Organization: Same

Sponsor: NA

One of the main hazards that can occur on a metropolitan railway is to have a fire on board. Several metropolitan railways, including those in London, Hong Kong, San Francisco, Stockholm and New York, have made a study of non-flammable materials. (RRIS)

Ref. No.: F 13

Safety Categories: 1

Title: Fire Safety and Fire Hazards  
Related to Polymeric Materials  
in Cars of WMATA

Date: Oct 1975

Source: NTIS, Order No.  
PB-244 971

Author: Panel of the Committee on Safety Aspects  
of Polymeric Materials

Organization: National Materials Advisory Board, Commission on  
Sociotechnical Systems, National Research Council

Sponsor: National Academy of Sciences

This report addresses a limited area of the fire safety problem, namely, the use of materials in car interiors. Nine conclusions on such subjects as frequency of electrical fires, factors involved in fire safety, relationship between comfort and aesthetic factors and fire load, use of hydraulic brake systems and use of polymeric wall and ceiling liners, seat cushions, carpeting and windows led to six short range and six long range recommendations relative to design choices in the interest of greater human safety. (Author)

Ref. No.: F 14

Safety Categories: 1

Title: Fire Safety Aspects of Polymeric  
Materials. Volume 8 - Land Trans-  
portation Vehicles

Date: 1979

Source: NAS, Order No.  
NMAB 318-8

Author: Committee on Fire Safety Aspects  
of Polymeric Materials

Organization: National Materials Advisory Board  
National Academy of Sciences

Sponsor: NA

This is the eighth volume in a series. The fire safety aspects of polymers are examined with primary emphasis on human survival. This volume is concerned with the polymeric materials used in subways, surface, and elevated urban railway vehicles; railroad vehicles; other rail vehicles (including unattended and semicontrolled type); buses, trucks; passenger automobiles; and miscellaneous vehicle types (including motorcycles and snowmobiles). Other volumes in the series deal with materials (state of the art); test methods, specifications, and standards; smoke and toxicity; fire dynamics and scenarios; aircraft (civil and military); buildings; ships, and mines and bunkers. A volume on elements of polymer fire safety and guide to the designer has been added to the series to pull together the disciplinary material of the first four volumes. This report examines the fire safety aspects to those polymeric materials currently used, or expected to be used, in land vehicles that transport people and materials. Excluded from consideration are specific materials such as fuels, engine lubricants and other engine polymers and hydraulic fluids. (Authors).



Ref. No.: F 15

Safety Categories: 1

Title: Fire Safety in Transit Vehicles

Date: May 19-22, 1980

Source: National Fire  
Protection Association,  
Batterymarch Park,  
Quincy, MA 02269  
(Proceedings of 84th  
Annual Meeting)

Author: W.T. Hathaway

Organization: TSC

Sponsor: UMTA, Office of Safety and Product  
Qualification

This paper describes work at TSC under UMTA sponsorship for identifying potential fire threat in transit systems and for providing methods of developing fire safety countermeasures to minimize the fire threat to the commuting public.

Ref. No.: F 16

Safety Categories: 7

Title: FRP Third Rail Protective Cover

Date: 1976

Source: 31st Annual Technical Conference of the Reinforced Plastics/Composite Institute (Society of the Plastics Industry, N.Y., N.Y.) Conference Paper 10-C, pp. 76-83

Author: L. P. Connors

Organization: NA

Sponsor: NA

An FRP protective cover is being used over the energized contact rail on the new Washington, D.C. METRO transit system. A unique combination of mechanical, electrical and special requirements led to the development of a system consisting of a pultruded cover supported by moulded brackets for this application. The various investigations which led to the optimum choice of materials and methods is described. The quality control procedures required to assure compliance with the specifications are reviewed. (RRIS)

Ref. No.: \*G 1

Safety Categories: 1,2,8

Title: A General Consideration Concerning  
Fire Safety in the Subway

Date: May 3-5, 1979

Reflexion Generale Sur la Securite  
Incendie dans le Metro

Source: U.I.T.P., Inter-  
national Subway Committee  
Meeting Proceedings,  
Stockholm, May 3-5, 1979

Author: G. Broust

Organization: R.A.T.P.

Sponsor: NA

A preventive method of combating the disastrous effects of subway fires is described. This method involves extensive analysis and planning when designing a fire safety system for a subway system. The document offers a summary of the general characteristics and behaviors of subway fires that need to be considered in any safety analysis involving fire. The author also discusses evacuation and fire-fighting procedures.

The paper is written in French, with no English summary.

Ref. NO.: \*G 2

Safety Categories: 4,6

Title: The Glasgow Underground -  
Design, Development and  
Construction of the New Cars

Date: May/June 1978

Source: Railway Engineer  
International, Vol. 3, No. 3,  
May/June 1978, pp. 23-28

Author: G.J.M. Botham

Organization: Metro-Cammell Ltd.

Sponsor: NA

The author, the assistant chief engineer at Metro-Cammell, gives a brief description of the design modifications used to make the London Transport Tube car suitable for the tunnel and track requirements of the Glasgow underground rail system. Safety was considered as the main factor when designing this vehicle. A number of photographs illustrate the areas of the car that were redesigned.

The article is written in English.

Ref. No.: G 3

Safety Categories: 3,10

Title: A Green Light for Advanced  
Train Controls

Date: Feb 1979

Source: IEEE Spectrum  
Vol. 16, No. 2, Feb 1979,  
pp. 44-49

Author: P. S. Kalra

Organization: Bechtel Corporation

Sponsor: NA

Second generation train control functions include automatic train supervision (ATS) with computers monitoring train location and performance to modify stopping times and running times between stations. Systems developed in the U.S., Britain, France and Germany are described and compared. Transposed cables, moving blocks, centralized computer control and microprocessors are used in various combinations to achieve various levels of sophistication. (Author)



Ref. No.: G 4

Safety Categories: 1,2,6,10

Title: Guidelines for the Design and Evaluation of Human Factors Aspects of Automated Guideway Transit Systems Date: Mar 1979

Source: NTIS, Order No.  
PB-294 817/2ST

Author: E. D. Sussman, A. M. Wichansky

Organization: TSC

Sponsor: UMTA

This document has been compiled to provide guidance in the planning, design, fabrication, and evaluation of human factors aspects of Automated Guideway Transit (AGT) Systems, including Downtown People Mover (DPM) systems. It is based on the present state of knowledge in the areas covered and as such it draws on: (1) past and ongoing research; (2) applicable national and international codes and standards; and (3) current practice in transportation construction, law enforcement, fire safety, and military operations. Design concepts such as passenger safety, security, comfort, and convenience are discussed in relation to various AGT subsystems, including the vehicle, the guideway, the command and control center, and the terminal. Potential interactions between AGT systems and the surrounding community are considered. The guidelines also address such issues as accommodations of elderly and handicapped passengers, design to facilitate emergency evacuation, determination of acceptable levels of ride quality, and the optimal assignment of command and control tasks to humans and machines. The appendix summarizes the major guidelines presented in the text in a convenient checklist format; it is intended for use in the planning and evaluation of existing and proposed AGT systems... (Authors)

Ref. No.: H 1

Safety Categories: 8

Title: Hazard Analysis--Space  
Applications to Mass Transit

Date: Jan 20-22, 1976

Source: Proceedings, 1976  
Annual Reliability and  
Maintainability Symposium,  
Las Vegas, Jan 20-22, 1976,  
pp. 251-256

Author: G.B. Mumma, W.R. O'Halloran

Organization: Martin Marietta Corp.

Sponsor: NA

The paper describes an aerospace hazard analysis method practiced by Martin Marietta for National Aeronautics and Space Administration (NASA)/United States Air Force (USAF) shuttle programs and presents an example of how this method is directly applicable to a mass transit system. Emphasis is given to the incorporation of an active and methodical hazard analysis program from the earliest possible design phase of a new system through the initial revenue years of the operational system, including maintenance activities. (RRIS)

Ref. No.: H 2

Safety Categories: 1,2

Title: Hong Kong Metro Cars Near Completion Date: Nov 1977

Source: International Railway Journal, Nov 1977, p. 31.

Author: International Railway Journal

Organization: Same

Sponsor: NA

Safety considerations have played an important role in the design of the Hong Kong rail vehicle. This article describes fire retardant plywood floorboards and a specially designed emergency door that can be lowered to form an exit ramp for passenger evacuations, among the safety measures incorporated in the design of this vehicle.

Ref. No.: H 3

Safety Categories: 3,4,6,8

Title: How System Safety Works in the  
NYC Transit Authority

Date: Feb 1978

Source: Traffic Safety,  
Vol. 78, No. 2, Feb 1978

Author: J. P. DeVito

Organization: NYCTA

Sponsor: NA

Article summarizes efforts to develop a formalized system safety plan.  
The efforts include:

1. Research
  - a. Determine the suitability of Lexan for use in subways
  - b. Data collection and analysis
2. Programs
  - a. Safety eyeglasses and vests
  - b. Training
3. Design
  - a. "jerk limit"
  - b. chime warning of door closing
  - c. windscreens by doors
  - d. increased lighting

Ref. No.: I 1

Safety Categories: 1

Title: Identification and Evaluation  
of Operational Alternatives  
for Materials Data Base

Date: July 1980

Source: NTIS, Report No.  
PB-81-124 869

Author: W.T. Hathaway, C.E. Bogner,  
I. Litant

Organization: TSC

Sponsor: UMTA

A review of the organization and operation of the Urban Mass Transportation Administration's Materials Data Bank is presented. Alternatives to the current system of Data Bank Operation are identified and evaluated. It is recommended that the best method for managing and disseminating the technical data will be accomplished via the Transportation Systems Center. A notice of the availability of this system will be published in the Federal Register. (Authors)



Ref. No.: I 2

Safety Categories: 1

Title: Identification of the Fire Threat  
in Urban Transit Vehicles

Date: June 1980

Source: NTIS, Report No.  
PB-80-217 631

Author: W.T. Hathaway, A.L. Flores

Organization: TSC

Sponsor: UMTA

To improve mass transportation, UMTA tasked the Transportation Systems Center (TSC) to assess the overall fire threat in transit systems and to identify and recommend suitable remedial actions. This report presents the identification of the fire threat in urban transit vehicles. The study is based on site visits/surveys to nine representative U.S. transit properties. The data collected from the nine transit properties represented all bus and rail rapid transit fire and smoke incidents which occurred at those transit properties during the calendar year 1978. Data was obtained from daily logs, operator reports, accident reports, police reports, and maintenance reports. These data are supplemented by fault tree diagrams and scenarios based on actual transportation fire and smoke incidents in TSC files, data analysis, interviews with transit personnel, and the use of maintenance manuals. Following a description of the TSC data acquisition methodology, the data are analyzed and discussed along with the relationship of the fault trees and scenarios to the identification of countermeasures.

Ref. No.: \*I 3

Safety Categories: 6

Title: In-Cab TV Platform Monitor

Date: Oct 1978

Source: Railway Engineer  
International, Oct 1978

Author: Railway Engineer International

Organization: Same

Sponsor: NA

The Amsterdam underground has used a wireless train TV monitor (developed by Siemens) since 1977. This system allows the driver to have a complete picture of the passenger loading operation along the length of his train. The technical characteristics and applications of this system are described in this short article.

The article is written in English.

Ref. No.: I 4

Safety Categories: 3,4

Title: Increased Rail Transit Vehicle  
Crashworthiness in Head-on  
Collisions.  
Volume I - Initial Impact

Date: June 1980

Source: NTIS, Report No.  
PB-80-205 727

Author: E.E. Hahn

Organization: IIT Research Institute,  
Chicago

Sponsor: UMTA, Office of Technology Development  
and Deployment

A two-dimensional analytic simulation model of the leading cars of two impacting transit car consists is formulated. This model is capable of simulating the mechanics of head-on impact of two transit cars on straight level track. Specifically the model is capable of establishing the critical parameters which govern whether the cars crush, override or crush with subsequent override. This simulation model is used to assess impact control devices currently in service such as anticlimbers, couplers and draft gear. The assessment involves (1) isolating the critical parameters which govern whether the cars crush, override, or crush with subsequent override and (2) developing recommendations concerning future directions of effort in design of effective impact control devices.

A detailed experimental test plan for evaluating the strength and effectiveness of future designs of impact control devices is developed.  
(Author)

Ref. No.: I 5

Safety Categories: 3,4

Title: Increased Rail Transit Vehicle  
Crashworthiness in Head-on  
Collisions.  
Volume II - Primary Collision

Date: June 1980

Source: NTIS, Report No.  
PB-80-205 743

Author: E.E. Hahn, S.C. Walgrane, T. Liber

Organization: IIT Research Institute,  
Chicago

Sponsor: UMTA, Office of Technology Development  
and Deployment

An analytical model in two dimensions, longitudinal and vertical, of the primary collision of two impacting urban railcar consists is formulated. This model includes the formulation of the leading cars developed in Part I of this program, and the distributions of mass and nonlinear force-deformation relationships existing among major structural sub-assemblages. This model also is capable of determining the extent of crushing and/or override suffered by the individual cars in the consists, as well as the time histories of displacement, velocity, and acceleration in both the longitudinal and vertical directions.

Methods are developed for generating the dynamic force-deformation relationships for structural subassemblages comprising the critical modules of railcars. These methods include finite-element analysis, scale modeling and full-scale testing procedures including specifications for required testing equipment and instrumentation. The finite element analytical method is utilized to generate the nonlinear force-deformation relationships among major components of a typical urban railcar. (Authors)

Ref. No.: I 6

Safety Categories: 3,4

Title: Increased Rail Transit Vehicle  
Crashworthiness in Head-on  
Collisions.  
Volume III - Guidelines for  
Evaluation and Development of  
New Railcar Designs

Date: June 1980

Source: NTIS

Author: A.H. Weidemann, A. Longinow, E.E. Hahn

Organization: IIT Research Institute,  
Chicago

Sponsor: UMTA, Office of Technology Development  
and Deployment

The nature and severity of potential injury and fatality producing mechanisms due to secondary collisions which occur in intracity train crash environments are assessed. This analytical methodology is used to identify the factors and car design parameters, including car interior components which significantly influence passenger injury and fatality. In this manner meaningful design guidelines are established which will minimize and/or limit the hazard to which the passengers will be exposed in the event of most crash environments. (Authors)



Ref. No.: I 7

Safety Categories: 3,4

Title: Increased Rail Transit Vehicle  
Crashworthiness in Head-on  
Collisions.  
Volume IV - IITrain, Users' Manual

Date: June 1980

Source: NTIS, Report No.  
PB-80-205 735

Author: E.E. Hahn

Organization: IIT Research Institute,  
Chicago

Sponsor: UMTA, Office of Technology Development  
and Deployment

A computer code for the simulated crash of two railcar consists is described. The code is capable of simulating the mechanics of head-on impacts of two consists on straight level track. The simulation is limited to two dimensions, namely a vertical plane containing the length of the track. The user can model the individual car components or cars in a complex or as simple a manner as is warranted by the simulation results desired. Although specifically developed for transit cars, the code can also be used to simulate freight trains or intercity passenger trains. (Author)

Ref. No.: I 8

Safety Categories: 10

Title: Information Acquisition,  
Transmission, and Storage  
Considerations in Large  
Automated Transit Systems

Date: Dec 3-6, 1978

Source: IEEE, National Tele-  
Communications Conference,  
Dec 3-6, 1978, Vol. 3,  
pp. 41.6.1-41.6.5

Author: J. F. Thompson

Organization: General Motors Corporation  
Transportation Systems Division,  
Detroit, Michigan

Sponsor: NA

The paper provides some insight into the types of communication problems that may arise in a large automated transit system, and the major alternative approaches necessary for the solution of these problems. The discussion covers types of information, possible organizations of systems communications, mechanization choices, and large system concepts. The challenge for a communications subsystem design is to develop a subsystem that provides sufficient capacity, is insensitive to momentary noise-induced data errors, is self-diagnosing at least insofar as the failure location is concerned, provides a fail operational response to most single failures, and is secure from external interference.

Ref. No.: I 9

Safety Categories: 8

Title: Innovation in Public  
Transportation: A Directory  
of Research, Development and  
Demonstration Projects,  
Fiscal Year 1979

Date: Mar 1980

Source: Supt. of Documents,  
U.S. Govt. Printing Office  
Washington, D.C. 20402  
Stock No. 1980 0-624-720/  
1726 REGION 3-1

Author: UMTA, Office of Research,  
Development and Demonstration

Organization: Same

Sponsor: NA

This annual directory contains descriptions of current research, development, and demonstration (RD&D) projects sponsored and funded by the U.S. Department of Transportation's Urban Mass Transportation Administration (UMTA). One of UMTA's major objectives is to make public information regarding its RD&D activities readily available, and this publication is one of the principal vehicles for reporting such information. All the projects described in this volume are funded under Sections 6,8, or 11 of the Urban Mass Transportation Act of 1964, as ammended.

Ref. No.: I 10

Safety Categories: 10

Title: An Integrated Approach to System  
Failure Effects

Date: Aug 24-30, 1976

Source: International Fed-  
eration of Automatic Con-  
trol, 6th Triennial World  
Conference, Boston and  
Cambridge, MA, Aug 24-30,  
1975, Part 3, pp. 26.21-26.27.  
(Order from Instrument  
Society of America)

Author: R. A. Reid

Organization: Philips Gloeilampenfabrieken,  
Eindhoven, Netherlands

Sponsor: NA

The failure modes and fault tree analysis techniques as used on spacecraft have been applied to a transport system study. A general approach to systems reliability has evolved and been applied to other systems. Based on an analysis of systems functional modes, the system level effects of a component deviation from nominal are derived. A grouped tree analysis of these events facilitates the allocation of probabilistic reliability requirements and provides good visibility when fail-safe or similar conditions apply. The approach is not limited to hardware. Computer programs and other software can also be analyzed and risks defined and minimized. (Author)

Ref. No.: L 1

Safety Categories: 3,8

Title: LBL Role and Recommendations  
with Respect to PUC Hearings  
on BART Safety Appliances and  
Procedures

Date: Feb 18, 1975

Source: NTIS, Order No.  
UCID-3775

Author: D.T. Scalise, D.M. Evans

Organization: Lawrence Berkeley Laboratory (LBL),  
University of California, Berkeley

Sponsor: BART

Methods are discussed for increasing the level of safety of the Bay Area Rapid Transit (BART) by reducing the susceptibility of the BART system to human error. Recent incidents clearly demonstrated the vulnerability of operations carried on in the manual mode. The recommendations emphasize that: (1) the potential of the automatic systems be more fully used, particularly with respect to maintenance vehicle detection; (2) the safety regulations for manual operations be analyzed thoroughly; and (3) an intense task force be assigned to address high priority problems. (RRIS)



Ref. No.: L 2

Safety Categories: 3,6,10

Title: Light-Rail Transit: Planning  
and Technology

Date: 1978

Source: TRB, Special Report  
182

Author: TRB

Organization: UMTA, TRB, APTA

Sponsor: Same

This special report contains the papers given at a 1978 conference, which cover a wide range of subjects related to light rail transit. Only two papers have relevance to safety:

Traffic Engineering for Light-Rail Transit,  
by H.W. Korve (pp. 107-115)

Control of Light-Rail Transit Operations in Edmonton,  
by W. O'Brien, J. Schnablegger, and S. Teply (pp. 115-119)

Ref. No.: L 3

Safety Categories: 7,9

Title: Light Rail Transit -  
Proceedings of a National  
Conference

Date: June 23-25, 1975

Source: TRB, Special  
Report No. 161

Author: TRB (eds.)

Organization: TRB

Sponsor: UMTA; APTA; University of Pennsylvania

The papers in this Special Report cover a wide range of subjects related to light rail transit. Safety and control is discussed briefly in the following three papers:

Electrification and Control Systems for Light Rail Systems,  
by R.D. Touton, Jr. (pp. 86-92)

Operating a Light Rail System, by R.S. Korach (pp. 111-114)

Light Rail Transit System Evaluation, by T.E. Parkinson  
(pp. 159-166)

Ref. No.: L 4

Safety Categories: 3

Title: Light-Rail Transit Signalling

Date: 1978

Source: TRB Special  
Report No. 182

Author: E. A. Burgin

Organization: Louis T. Klauder and Associates

Sponsor: TRB

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)

Ref. No.: \*L 5

Safety Categories: All

Title: The Lille Metro

Date: 1975

Le Metro De Lille

Source: Etablissement  
Publique d' Aménagement de  
la Ville Nouvelle de Lille,  
France

Author: Etablissement Publique  
d'Aménagement de la Ville  
Nouvelle de Lille, France

Organization: Same

Sponsor: NA

This report gives an extensive description of the planning and analysis incorporated in the design of the Lille Metro system. Safety is examined in two sections or classes; system safety and passenger safety.

System safety, is defined as being the "safety equipment and functions that do not require direct passenger intervention." System safety at the Lille Metro is developed around periodically inspected electromechanical and electronic equipment, which has been designed to stop trains and maintain the safety of the system. The safety level for the system was computed by calculating the potential accident probability co-efficient, a relatively successful method of analysis developed by Prof. Gabillard of the Scientific and Technical University of Lille. The RATP supplied the data base for this analysis.

Passenger safety, "involves all the devices and operating procedures designed to prevent injury to passengers, whatever action those same passengers take." These safety measures include on-board fire extinguishers, safety gates that prevent falls and suicides on platforms, and manual door opening devices on trains. This report also gives an account of the operating procedures during hazardous incidents.

The report is written in French, with no English summary.

Ref. No.: \*L 6

Safety Categories: 1

Title: London's Underground System  
Goes off the Rails

Date: Jan 31, 1980

Source: New Scientist  
Vol. 85, No. 1192, Jan 31,  
1980, p. 318

Author: New Scientist

Organization: Same

Sponsor: NA

London Transport is looking at means for preventing further deterioration of its aging subway facilities. Materials more resistant to vandalism are being used. Studies are being made of a means of "damp proofing" old tunnels, of sound barriers, of securement of tile linings and effects of passing trains on such finishes, and of fire-resistant materials. (RRIS)

The article is written in English.



Ref. No.: M 1

Safety Categories: 1,2,8

Title: MARTA Systems Safety, Fire Protection, and Code Documentation

Date: Oct 17-21, 1977

Source: Third International System Safety Conference Proceedings, Oct 17-21, 1977 (System Safety Society) pp. 517-527

Author: W. E. Gooden, J. J. Troy

Organization: Parsons, Brinkerhoff, Quade, and Douglas, Inc./Tudor Engineering Co.; Gage-Babcock and Associates, Inc.

Sponsor: MARTA

The paper describes MARTA's System Safety approach to designing the system. The author discusses local and state fire codes that apply to station design, and lists the components of the fire protection system.

Ref. No.: M 2

Safety Categories: 8

Title: MARTA Systems Safety Verification:  
A Rail Rapid Transit Application  
of Systems Safety Technology

Date: Oct 17-21, 1977

Source: Third International  
System Safety Conference  
Proceedings, Oct 17-21, 1977  
(System Safety Society)  
pp. 731-741

Author; A. M. Lock, W. E. Gooden  
R. H. Jacob

Organization: Parsons, Brinkerhoff, Quade,  
and Douglas, Inc./Tudor Engineering Co.

Sponsor: MARTA

The authors outline MARTA's Systems Safety Program Plan, explaining the sequence and characteristics of research analysis, design, and review. Because MARTA developed a more comprehensive safety plan than have other Transit Authorities, the focus of the article is on explaining the procedures used to try to ensure that:

"(1) System safety goals and criteria were established and implemented throughout the system, (2) system safety hazards were identified and assessed as early as possible in the design phases, (3) that appropriate actions will be taken to eliminate, minimize, or control the identified critical/catastrophic hazards, and (4) that the MARTA system will be verified to be safe for revenue service prior to opening date." (Authors, p. 732)

Ref. No.: M 3

Safety Categories: 3,6,10

Title: MARTA Train Control System - A View Date: Oct 1979  
from the Wayside

Source: IEEE, Confer-  
ence Paper No. 79CH1484-  
51A

Author: J. J. Weinstein

Organization: General Railway Signal Co.

Sponsor: NA

This paper describes the Metropolitan Atlanta Rapid Transit Authority (MARTA) train control system. The major operational features are discussed to direct the reader's attention to the relative importance of the wayside subsystem. The MARTA system is described through five major operational features, with special emphasis on the wayside subsystem as a local point of system operations. The aspects of the automatic and manual modes of operation are explained in detail to emphasize the attention that has been given to the design of the system to ensure uninterrupted service. (Author)

Ref. No.: M 4

Safety Categories: 1

Title: Measurements and Observations of  
the Toxicological Hazard of Fire  
in a Metrorail Interior Mock-Up

Date: Feb 1976

Source: NTIS, Order No.  
PB-250 768/9ST

Author: M. Paabo et al.

Organization: Johns Hopkins University

Sponsor: National Bureau of Standards

Oxygen depletion, carbon monoxide, carbon dioxide, hydrogen chloride and hydrogen cyanide were selected for measurement and identification in Metrorail fire tests.

Male rats exposed to the combustion products were examined for changes in blood chemistry, gross pathology and loss of function. Hydrogen cyanide and carbon monoxide levels in blood were elevated and functional changes were noted. (Author)

Ref. No.: M 5

Safety Categories: 7, 8

Title: Methodology for the Design of  
Urban Transportation Interface  
Facilities

Date: Dec 1976

Source: NTIS, Order No.  
PB-269 956/9ST

Author: M. J. Demetsky, L. A. Hoel,  
M. R. Virkler

Organization: University of Virginia

Sponsor: DOT, Office of University Research

Procedures and techniques are described which determine measures of the performance of transit station designs. Categories of measures are defined according to the manner by which they are treated in the design process, as a result of policy, or as measures of performance and economic efficiency. Policy items considered include concessions, advertising, personal care facilities, telephones, acoustics, construction materials, design flexibility, parking facilities, and provisions for the handicapped. Performance measures are associated with passenger processing, passenger orientation, the physical environment safety, and security. The policy and performance considerations along with cost factors are used to specify a systematic transit interchange facility design methodology that is recommended to practitioners. Comprehensive descriptions of appropriate analytical techniques for the evaluation of transit station designs are provided in the appendices to the report. (RRIS)



**Ref. No.:** M 6

**Safety Categories:** 1,2,3,5,6,7,8

**Title:** Moving People Safely, Safety  
Guidelines for Urban Transit Systems

**Date:** 1977

**Source:** APTA

**Author:** American Public Transit Association

**Organization:** Same

**Sponsor:** NA

Safety guidelines concerning various operating and maintenance procedures are described. These recommendations recognize that applicability to a particular transit system is affected by local operating conditions. However, certain procedures are considered fundamental for safe operations. Recommendations for general safety and inspection procedures, a code of uniform operating rules, emergency response and accident reporting are among the aspects of rapid rail safety which are discussed.

Ref. No.: \*N 1

Safety Categories: 3,5,10

Title: New Applications of the Teloc-E  
Electronic Speed Measuring System

Date: 1979

Source: Hasler Review Vol. 12,  
No. 1, Spring 1979, pp. 14-19  
(Hasler A.G., Belpstrasse 23,  
CH 3000, Berne 14, Switzerland)

Author: P. Zimmerman

Organization: Hasler A. G.

Sponsor: NA

A new range of equipment, derived from the Teloc-E speed measuring systems, operates on a mixed digital-analog principle. These hybrid systems are particularly suitable for applications where the requirements are less exacting as regards the number of functions that have to be performed. Up to now they have mainly been employed for underground railways. Since these are usually equipped with automatic train control, the concept of the Hasler equipment has to be matched to the automatic system of the train in each case. (Author).

The article is written in English.

Note: See Refs. \*T 1 and \* T 2.

Ref. No.: N 2

Safety Categories: 3,9

Title: New Brake Equipment for  
Cramped Transit Conditions

Date: Nov 1977

Source: International Rail-  
way Journal, Nov 1977, p. 60

Author: International Railway Journal

Organization: SAB

Sponsor: NA

SAB, a Swiss manufacturer, has developed a number of braking systems for use on mass transit and high ground speed vehicles. This one page article gives descriptions of these various technologies and their applications.

Ref. No.: \*N 3

Safety Categories: 3

Title: New Developments and  
Applications in Hasler  
Railway Electronics

Date: 1976

Source: Hasler Review,  
Vol. 9, No. 2, Summer 1976  
(Hasler A.G., Belpstrasse 23,  
CH 3000, Berne 14, Switzerland)  
p. 24

Author: P. Zimmerman

Organization: Hasler A.G.

Sponsor: NA

This article features two innovations designed by Hasler. The first is an electronic anti-slip device which operates directly on the brakes and is able to release the brakes independently of the train control system. Any problem within the system will release the pneumatic brakes throughout the train. The second innovation discussed in this article is a traction device. The Madrid Underground Company has installed these devices in 65 of the Metropolitana new coaches. The article looks at the applications and functions of these devices in the Madrid vehicles.

The article is written in English.

Ref. No.: N 4

Safety Categories: 1

Title: New Generation of Rail Cars  
Boosts Paris Metro Capacity

Date: May/June 1978

Source: Metropolitan,  
May/June 1978, p. 76

Author: Metropolitan

Organization: Same

Sponsor: NA

This short article refers to a research study commissioned by the RATP which focused on the flame and smoke properties of a variety of insulation materials for electric power systems. The study was undertaken to find the most suitable materials for the MF 77 rolling stock. Kapton, an insulating material produced by Du Pont, was found to retard the generation of flames and smoke.

The RATP considered Kapton, a polyimide film used in aircrafts and railroads, as the best means of ensuring maximum fire safety in the MF 77 rolling stock.



Ref. No.: \*N 5

Safety Categories: 8

Title: The New Hong Kong Underground  
Railway

Date: 1980

Source: Union Internationale des  
Transports Publiques, Revue  
(Avenue de l'Uruguay 19, B-1050  
Brussels, Belgium) Vol. 29, No. 2,  
1980, pp. 114-124

Author: A.R. Cotton

Organization: Mass Transit Railway Corp.

Sponsor: NA

This paper describes some of the planning for the Hong Kong Mass Transit Railway from the operations aspect. Successful operation of a mass transit railway, especially one as busy as the MTR, requires comprehensive planning of policies and development of appropriate recovery drill, training, discipline, coordination and high morale. (RRIS)

The paper is written in English.

Ref. No.: N 6

Safety Categories: 3,10

Title: New York City Transit Authority  
Design Guidelines: Signals and  
Communication.

Date: Mar 1975

Source: NTIS, Order No.  
PB-251 646/6ST

Author: NYCTA

Organization: Same

Sponsor: UMTA

The main purpose of signalling is to provide safety and headway for rapid transit operations. This is accomplished by installing and interconnecting thousands of components of signal equipment into a coordinated system that, in all phases, stresses safety. There are three main classifications of signals: automatic signals, approach signals and home signals. The purpose of the manual is to assist in standardizing the procedures involved in furnishing and installing of equipment to establish a signal system. (Author)

Ref. No.: N 7

Safety Categories: 1,2,3,4,5,  
6,7,8

Title: NTSB Safety Recommendations

Date: Various

Source: NTSB

Author: NTSB

Organization: Same

Sponsor: NA

The National Transportation Safety Board issues timely recommendations following investigation of accidents or unsafe situations. During the time period covered by this bibliography, NTSB published ten documents containing one or more safety recommendations, entitled as follows:

Safety Recommendation(s) R-77-14 through 17  
Safety Recommendation(s) R-77-19  
Safety Recommendation(s) R-77-20 through 23  
Safety Recommendation(S) R-77-24  
Safety Recommendation(s) R-79-1 and 2  
Safety Recommendation(s) R-79-12 and 13  
Safety Recommendation(s) R-79-42 through 52  
Safety Recommendation(s) R-79-53  
Safety Recommendation(s) R-79-54 and 55  
Safety Recommendation(s) R-79-56  
Safety Recommendation(s) R-79-62 and 63  
Safety Recommendation(s) R-80-1  
Safety Recommendation(s) R-80-8 and 9

These recommendations are subsequently incorporated into published Railroad Accident Reports.

NTSB Safety Recommendation R-78-42, July 1978, is of a more general nature and develops a profile of the average pedestrian killed by a train (not limited to rail transit).

Ref. No.: \*O 1

Safety Categories: 3,10

Title: Operating Control Techniques in  
Local Rail Traffic

Date: May 1979

Betriebsleittechnik im Schienenge-  
bundenen Nahverkehr

Source: Internationales  
Verkehrswesen, Vol. 31, No. 3,  
May 1979, pp. 172-175

Author: H. Sperl

Organization: NA

Sponsor: NA

In short distance rail traffic, operating techniques play a major role in guaranteeing running safety and automating the network. The author describes the limits of existing possibilities and the tasks to be fulfilled and then gives details of a hierarchical system of process computers. He quotes the example of the system being installed in Hamburg. (RRIS)

The article is written in German, with no English summary.

Ref. No.: O 2

Safety Categories: 8,10

Title: Operational Safety of  
Transportation Systems

Date: Oct 17-21, 1977

Source: Third International  
System Safety Conference  
Proceedings, Oct 17-21, 1977  
(System Safety Society)  
pp. 715-730

Author: A. C. Gieda, R. F. Sidley

Organization: Boeing Aerospace Co.;  
BARTD Vehicle Reliability  
Engineering

Sponsor: BART

The article describes Sneak Analysis, a computerized technique which detects potential latent signal paths in complex electrical systems. Because these latent paths may unexpectedly initiate or inhibit system functions, detecting them in advance may locate areas for which the design should be changed. The technique describes how Sneak Analysis works and how it may be applied to rapid transit systems. It is claimed that the technique can disclose unsafe operational modes which are not revealed by other techniques or by years of normal operation.



Ref. No.: P 1

Safety Categories: 8

Title: Passenger Safety and Convenience  
Services in Automated Guideway  
Transit.  
Volume I, Data Collection Scenarios  
and Evaluation.  
Volume II, Guidebook

Date: Dec 1979

Source: NTIS, Order Nos.  
PB80-167 059 for Vol. I  
PB80-167 067 for Vol. II

Author: R. L. Dauber

Organization: Vought Corporation, Dallas TX

Sponsor: UMTA/TSC

....A guidebook detailing the most effective methods and procedures for the accomodation of Systems Safety and Passenger Security. The primary intent....is to provide guidance associated with abnormal occurrences that have an impact on routine passenger services or safety....Practices .... both conventional and AGT have been assessed as applicable to highly automated transit systems. These guidelines have been developed suggesting methods and procedures to provide these services for AGT systems. The final objective of this guidebook is to provide the most effective methods and procedures for ensuring passenger safety and convenience services in AGT systems. Its contents provide guidance for AGT system planners, designers, operators, and evaluators in identifying potential problems and assessing proposed methods and procedures. (From author's abstract)

Ref. No.: \*P 2

Safety Categories: 3

Title: A Peculiarity of Railway  
Signalling: The Overlap

Date: Apr 1977

Une Particularite de la  
Signalisation Ferroviaire:  
l'Overlap

Source: Revue Generale des  
Chemins de Fer, Apr 1977  
(Societe Nationale des Chemins  
de Fer Francais, 92 rue  
Bonaparte, 75 Paris 6e France)

Author: G. Besacier

Organization: International Union of Railways

Sponsor: NA

After giving a concise historical background to railway signalling, the author defines overlap and the different ways of achieving it in practice; with the automatic block, the overlap involves there being a protective zone down the line from each block signal and this effects the block signal control for the section immediately up the line. The author then refers to uses of overlap on the metropolitan railways in London, Paris, Munich, Nuremberg and discusses the purpose of the system. (RRIS)

The article is written in French, with no English Summary.

Ref. No.: \*P 3

Safety Categories: 10

Title: People Movers and the March  
of the Microchip

Date: Mar 1980

Source: Control and Instru-  
mentation, Vol. 12, No. 3,  
March 1980, pp. 45-49

Author: A. Mandel, M. McDonald

Organization: Westinghouse Electric Company

Sponsor: NA

Details are given of the new vehicle automatic train control (VATC) system from Westinghouse. It is a microprocessor-based vehicle control system which is compatible with both steel wheel and rubber-tired people mover systems. The system is currently being manufactured for the Sao Paulo metro subway and for systems at the new Atlanta and Orlando airports in the USA. By 1982, a pair of rubber-tired cars holding about 30 people will be shuttling to and fro on a 300 M track between the main building at Gatwick and a satellite terminal on the northern apron. A dual microprocessor control system approach has been followed in the design of the vehicle ATP (automatic train protection) system. The redundant control channels in this design have been implemented using two microprocessors in a checked redundant fashion to achieve safety. Train detection is accomplished by utilization of two of the rails in the power collection system. This system is described with reference to the speed code generation system ( a six bit, comma-free code). Other features described are: the overspeed detector circuit, the vehicle ATO system (automatic train operation) and the automatic line supervision. (RRIS)

The article is written in English.

Ref. No.: \*P 4

Safety Categories: 2,3,  
5,6,7,8,9

Title: Personnel-Free Operation  
in the OPNV

Date: Mar 1976

Personalfreier Betrieb  
im OPNV

Source: Hamburg-Consult, 2000  
Hamburg | Steinstrasse 20,  
Germany

Author: M. Runkel, H. H. Weiss

Organization: Hamburg-Consult

Sponsor: NA

Two volumes of this eleven volume report are particularly relevant to safety:

Vol. II, Vehicle Dispatching (Fahrzeugabfertigung). Section 1, a systems analysis of train dispatching, includes (pp. 5-23) an analysis of types of hazard for system users, and tables of accident occurrences in the Hamburg underground during 1975.

Vol. III, Passenger Security and Traffic Patterns (Sicherheit der Fahrgaste und verkehrlichen Anlagen) analyzes passenger security and safety, and discusses the effectiveness of various safeguards and counter measures. This volume contains 11 illustrations and 8 tables, most of which have some relevance to safety issues.

The entire report is in German. There are no English summaries.

Ref. No.: P 5

Safety Categories: 1,2,6,7

Title: Personnel Safety on Electrified  
Railroads

Date: June 1980

Source: NTIS, Report No.  
PB-80-220 858

Author: J.D. Abbas, W.E. Phillips, JR.  
A. Kusko, C.M. King

Organization: Kusko (Alexander), Inc.,  
Needham, MA.

Sponsor: FRA/TSC

Potential electrical hazards to fire, police, and rescue personnel responding to emergencies on electrified railways are examined. Data on descriptions of electrical facilities, types of accidents and danger to emergency personnel, and review of operating procedures have been obtained during a series of visits to electrified rail and transit systems. Programs to reduce electrical hazards to emergency personnel are proposed. These programs are evaluated by a cost-benefit comparison, and recommendations are selectively made. Joint development of emergency operating plans by rescue and railroad organizations, and installation of direct telephone lines to the power director are recommended as being most cost-effective. (Authors)



Ref. No.: P 6

Safety Categories: 7

Title: Planning and Design of Inter-  
modal Transit Facilities

Date: 1976

Source: TRB, Research Record  
No. 614, Transit Facility  
Operations, pp. 1-5

Author: L. A. Hoel, E. S. Rozner

Organization: University of Virginia;  
GAI Consultants

Sponsor: NA

This paper presents an analysis of the present state-of-the-art of transit station planning and design. It discusses the design process in terms of (a) design parameters and standards (e.g., stairways, ramps, and passageways; escalators; platforms; fare and exit control; moving walkways and ramps; bus facilities; and parking facilities); (b) design of the station environment (e.g., lighting, ventilation, acoustics, and fire control; passenger information and graphics; passenger security; commercial activities; and special provision for the handicapped); and (c) design methodology (e.g., deterministic, probabilistic, and impedance models; simulation; and validation problems). A classified bibliography is included. (RRIS)

Ref. No.: P 7

Safety Categories: 1

Title: Plastics for Mass Transit Vehicles Date: Oct 28, 1976

Source: Amer. Soc. for  
Metals, Metals Park, Ohio,  
Paper No. N 76-31:76

Author: I. Litant

Organization: TSC

Sponsor: UMTA

Polymeric material used in mass transit vehicles are: wall and ceiling panels, seats, cushions, fabrics, carpets, elastomers, ducts, windows and lighting diffusers, thermal and acoustical insulation, floors, electrical insulation, and cab ends and other exterior panels. The flammability aspects of plastics are considered a major factor in the choice of materials. (Author)

Note: Copies of this paper may also be obtained from the author, TSC, Mail Code 332.

Ref. No.: \*P 8

Safety Categories: 3,6,10

Title: Points and Traffic Lights under  
Common Control using Vetag

Date: May 1975

Source: Railway Gazette  
International, Vol. 131,  
No. 5, May 1975, pp. 193-194

Author: F. Meyer

Organization: NA

Sponsor: NA

A trial installation of Phillips' Vetag (vehicle tagging) equipment will be made in Amsterdam following a policy decision on adopting a standard method of automatic control of tramway switches and traffic lights. Vetag functions to detect, identify and locate selected vehicles in a stream of road traffic and is adapted to automation of LRT or streetcar signalling which must operate without external supervision. Vetag consists of three basic units--an interrogator installed along the roadway, a detection loop in the roadway surface and a transponder underneath each vehicle. (RRIS)

The article is written in English.

Ref. No.: P 9

Safety Categories: 5

Title: Preliminary Analysis of the Effects  
of Non-Linear Creep and Flange Con-  
tact Forces on Truck Performance  
in Curves

Date: May 1975

Source: NTIS, Order No.  
PB-262 177/9GA

Author: A. B. Perlman, H. Weinstock

Organization: TSC

Sponsor: UMTA

Production of wheel displacements and wheel-rail forces is a prerequisite to the evaluation of the curving performance of rail vehicles. This information provides part of the basis for the rational design of wheels and suspension components, for establishing criteria for maintenance of track and wheels, for use as a guideline for safety standards, and for understanding the mechanism of noise generation and wheel-climbing. The analysis presented here extends the results from linear steady curving appropriate to flangeless guidance, and provides a foundation for the examination of the details of forces and displacements under more severe conditions necessary to the understanding, prevention, and suppression of undesirable effects. (Authors)

Ref. No.: \*P 10

Safety Categories: 8

Title: The Price of Safety

Date: Jan 1977

Source: Proceedings,  
Institute of Mechanical  
Engineers, Jan 1977,  
pp. 1-9

Author: I. K. A. McNaughton

Organization: NA

Sponsor: NA

An overview of the historical development of railway safety is discussed. Emphasis is placed on improvements in railway safety during the past fifteen years. Suggestions are made for achieving safety in areas the author considers to have been overlooked, but the need for further research is questioned.

The article is written in English.



Ref. No.: P 11

Safety Categories: All

Title: Proceedings of the Third UMTA R&D  
Priorities Conference, Cambridge,  
Massachusetts, November 1978.  
Vol. V: UMTA Special Technology  
Programs Workshops

Date: Nov 1978

Source: NTIS, Order No.  
PB-300 990

Author: TSC

Organization: Same

Sponsor: UMTA

These proceedings were published in nine volumes. For purposes of the present bibliography the only relevant item is contained in Volume V, and consists of a prepared talk on UMTA's Safety Program by Mr. William J. Rhine, Director, Office of Safety and Product Qualification, UMTA.

Ref. No.: P 12

Safety Categories: 4

Title: Proceedings of the Urban Rail  
Vehicle Crashworthiness Workshop  
Held at Cambridge, Massachusetts  
on April 13-14, 1978

Date: Oct 1979

Source: NTIS, Order No.  
PB80-127 327

Author: R.J. Madigan, M.M. Chen (eds.)

Organization: TSC

Sponsor: UMTA

This document contains the proceedings of the Urban Rail Vehicle Crashworthiness Workshop held at the Transportation Systems Center, Cambridge, Massachusetts, April 13-14, 1978. The workshop brought together researchers, manufacturers, users, and government representatives to exchange information on crashworthiness, both to share knowledge and to provide input as to further research needs. (Authors)

Ref. No.: \*P 13

Safety Categories: 10

Title: Process Controllers for Traffic  
Direction

Date: June 11, 1975

Prozessrechner in der Verkehrs-  
lenkung

Source: Electrotechnische  
Zeitschrift, Vol. 27, No. 14,  
June 11, 1975, p. 377

Author: Elektrotechnische Zeitschrift

Organization: NA

Sponsor: NA

Application of computerized control for the railroad in Saarbrücken, for the buses and streetcars in Hannover and as an aid in waterways traffic is described. (RRIS)

The article is written in German, with no English summary.

Ref. No.: R 1

Safety Categories: 8

Title: Rail Rapid Transit Safety Review

Date: Feb 1978

Source: DOT, Office of Environment and Safety, Office of the Assistant Secretary for Policy and International Affairs

Author: DOT, Office of Environment and Safety, Office of the Assistant Secretary for Policy and International Affairs

Organization: Same

Sponsor: NA

In response to the occurrence of four serious rail rapid transit accidents between 1975 and 1977, DOT, UMTA, and FRA reviewed the effectiveness of Federal efforts to ensure RRT safety. The delegation of Federal responsibilities (such as accident data collection, regulation, and research) was reviewed and general recommendations were made to further develop an RRT safety program. The report includes summaries of the findings of seven RRT safety assessments written between 1970 and 1976.

Ref. No.: R 2

Safety Categories: 1,2,8

Title: Railroad Accident Report: Bay Area Rapid Transit District Fire on Train No. 117 and Evacuation of Passengers While in the Trans-bay Tube, San Francisco, California, January 17, 1979

Date: July 19, 1979

Source: NTSB, Report No. NTSB-RAR-79-5

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 6:06 p.m., on January 17, 1979, the fifth and sixth cars of the seven-car westbound train No. 117 of the Bay Area Rapid Transit District (BART) caught fire while moving through the tunnel under the San Francisco Bay between Oakland and San Francisco, California. Forty passengers and two BART employees were evacuated from the burning train through emergency doors into a gallery walkway located between the two single track tunnels and then into a waiting train in the adjacent tunnel. One fireman died when the gallery suddenly filled with heavy black toxic smoke. Twenty-four firemen, seventeen passengers, three emergency personnel, and twelve BART employees were treated for smoke inhalation. Property damage was estimated to be \$2,450,000. The National Transportation Safety Board determines that the probable cause of this accident was the breaking of collector shoe assemblies on Train No. 117, when it struck a line switchbox cover, which had fallen from an earlier train, resulting in a short circuit and fire. Contributing to the severity of the damage was the failure of BART to quickly and properly coordinate the Oakland and San Francisco fire departments' rescue and firefighting efforts, which did not conform with the emergency plan. The cause of the fatality and injuries was inhalation of smoke and toxic fumes emitted from burning plastic materials used in construction of the transit cars. (Author)



Ref. No.: R 3

Safety Categories: 3,4,8

Title: Railroad Accident Report:  
Chicago Transit Authority  
Collision of Trains No. 104  
and No. 315 at Addison Street  
Station, Chicago, Illinois,  
January 9, 1976

Date: July 8, 1976

Source: NTSB, Report No.  
NTS-RAR-76-9

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

On January 9, 1976, at 8:06 a.m., Chicago Transit Authority (CTA) train No. 315 struck the rear end of train No. 104 while it was standing at the Addison Street Station platform in Chicago, Illinois. The impact forces extensively damaged the lead car of the moving train and the rear car of the standing train, and slightly damaged the other cars in both trains. Damage to the equipment and track was estimated to be \$267,000. Of the 381 passengers who were injured in the collision, 1 passenger died. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the motorman of train No. 315 to perceive standing train No. 104 at a sufficient distance to permit him to stop his train before striking No. 104. Contributing to the collision were the rule that permitted the operation of the train with the automatic train control and the cab signals inoperative, the lack of consistent enforcement of operating rules, the absence of flag protection against following trains, the failure of the train phone system to provide reliable communications, and the violation of the 25-mph speed limit required by Rule 178B. (Author)

Ref. No.: R 4

Safety Categories: 3,8

Title: Railroad Accident Report:  
Collision of Port Authority of  
Allegheny County Trolley Car  
No. 1790 and Bus No. 2413,  
Pittsburgh, Pennsylvania,  
February 10, 1978

Date: Aug 17, 1978

Source: NTSB, Report No.  
NTSB-RAR-78-5

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 8:03 a.m., on February 10, 1978, a trolley car and a bus owned by the Port Authority of Allegheny County collided in Pittsburgh, Pennsylvania, when the trolley car suddenly turned into the path of the oncoming bus. Four persons were killed, 37 persons were injured, and damage was estimated to be \$48,000. The National Transportation Safety Board determines that the probable cause of this accident was the operator's inadvertent and untimely operation of an unprotected track switch, which caused the trolley car to be routed into the path of the approaching bus. Contributing to the accident was the operator's operation of the car at a speed too great to permit stopping when he detected the turning movement of the car, and the lack of protective devices to control the switch operation. Two recommendations were made to the Port Authority of Allegheny County, Pennsylvania, about the means by which the track switch can be operated from the trolley car and about providing protection against the switch operating when another vehicle is in a danger zone. A recommendation was also made to the Governor of the Commonwealth of Pennsylvania, urging the State to encourage communities that have emergency response facilities to establish emergency procedures for disasters. (Author)

Ref. No.: R 5

Safety Categories: 5,6,8

Title: Railroad Accident Report: Derailment of New York City Transit Authority Subway Train, New York, New York, December 12, 1978

Date: Aug 2, 1979

Source: NTSB, Report No. NTSB-RAR-79-8

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 4:38 p.m., on December 12, 1978, the sixth and seventh cars of a New York City Transit Authority subway train designated "CC" 4:06 p.m. derailed within moments after departing 59th street station. Twenty-two persons were injured, and property damage was estimated to be \$667,500. While the Safety Board was investigating the accident, three other trains derailed from what appeared to be similar causes. Therefore, the investigation was expanded to include all four accidents. The National Transportation Safety Board determines that the probable cause of each of the four accidents was a cracked wheel which had resulted from extensive overheating. Contributing to the cause of the overheating of the wheels was the partial application of a handbrake. Because of a lack of adequate inspection procedures, the New York City Transit Authority employees failed to detect the partially applied handbrake and the thermally damaged wheels before they cracked. (Author)

Ref. No.: R 6

Safety Categories: 3,8

Title: Railroad Accident Report: Head-On  
Collision of Two Greater Cleveland  
Regional Transit Authority Trains,  
Cleveland, Ohio, July 8, 1977

Date: Feb 9, 1978

Source: NTSB, Report No.  
NTSB-RAR-78-2

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 10:05 a.m., E.D.T., on July 8, 1977, two trains of the Greater Cleveland Regional Transit Authority collided head-on on the eastbound track of the Shaker Heights Line, near 92nd and Holton Streets in Cleveland, Ohio. Sixty persons were injured and property damage was estimated to be \$100,000. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the Greater Cleveland Regional Transit Authority to have established rules and procedures and special instructions to assure safe train operations. Contributing to this accident were the failure of both supervisors to establish and coordinate adequate local procedures for operating trains in both directions on a single track and, further, the vegetation along the curve which was allowed to grow to the extent that the view was blocked. (Author)



Ref. No.: R 7

Safety Categories: 3,8

Title: Railroad Accident Report: Rear  
End Collision of Three  
Massachusetts Bay Transportation  
Authority Trains, Boston,  
Massachusetts, August 1, 1975

Date: Apr 14, 1975

Source: NTSB, Report No.  
NTSB-RAR-76-5

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

On August 1, 1975, during the evening rush hour, southbound traffic on the Red Line of the Massachusetts Bay Transportation Authority in Boston backed up because of a train standing at a stop signal in the tunnel south of Charles Street Station. Train 1402, a four-car "Bluebird" train, stopped at signal 236 because of the backup. Train 1604, a four-car "Silverbird" train, was keyed by signal 234 and crashed into 1402 about 4:58 p.m. About 3 minutes later, a four-car "Bluebird" train 1431, crashed into the rear of train 1604. One hundred and fifty-four persons were injured; total damage to equipment was estimated to be \$425,000. The National Transportation Safety Board determines that the probable cause of this accident was the malfunction of the train-stop tripper and the subsequent operation of trains 1604 and 1431 in violation of the rules and in excess of the speed at which they could stop short of collisions in the available sight distances. (Author)

Ref. No.: R 8

Safety Categories: 3,5,8

Title: Railroad Accident Report: Rear  
End Collision of Two Chicago  
Transit Authority Trains,  
Chicago, Illinois,  
February 4, 1977

Date: Nov 29, 1977

Source: NTSB, Report No.  
NTSB-RAR-77-10

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 5:27 p.m., C.S.T., on February 4, 1977, Chicago Transit Authority Lake-Dan Ryan train No. 930 struck the rear of Ravenswood train No. 415, which was standing on the elevated rail structure at the intersection of Wabash Avenue and Lake Street. The four lead cars of the eight-car Lake-Dan Ryan train overturned and fell from the elevated structure to the street. One end of each of the two rear cars of the Ravenswood train derailed. Eleven persons were killed and 266 persons were injured. Property damage was estimated to be \$1.2 million. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the motorman to exercise due care in meeting his responsibilities and the unauthorized operation of the Lake-Dan Ryan train into a signal block occupied by the standing Ravenswood train, at a speed that was too fast to stop after the operator sighted the standing train. (Author)

See also Ref. A 3.



Ref. No.: R 9

Safety Categories: 3,8

Title: Railroad Accident Report: Rear  
End Collision of Two Greater  
Cleveland Regional Transit  
Authority Trains, Cleveland,  
Ohio, August 18, 1976

Date: Aug 4, 1977

Source: NTSB, Report No.  
NTSB-RAR-77-5

Author: NA

Organization: NTSB, Bureau of Accident Investigation

Sponsor: Same

About 11:35 a.m., on August 18, 1976, Greater Cleveland Regional Transit Authority train No. 461 struck the rear of train No. 409 which was standing near the East 79th Street Station in Cleveland, Ohio. Twenty persons were injured and property damage was estimated to be \$61,000. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the operator of train No. 461 to comply with the mandatory stop signal indication and to apply the brakes in emergency promptly after the train ahead had been sighted, and operation of the train at an excessive speed. Contributing to the probable cause was the lack of an effective operator training program and the ineffectiveness of the protective devices and procedures to prevent a following train from entering an occupied block. As a result of its investigation of the accident, the National Transportation Safety Board made four recommendations to the Greater Cleveland Regional Transit Authority concerning the operation of the system, and one to the Federal Railroad Administration. (Author)

Ref. No.: R 10

Safety Categories: 10

Title: Railroads: Green Lights for the  
Bullets

Date: Sep 1977

Source: IEEE Spectrum,  
Sep 1977, pp. 71-74

Author: T. Ishihara

Organization: Japanese National Railways

Sponsor: NA

The Japanese National Railways operates as many as 28,000 trains a day on its 21,161-km system. The worlds fastest service is on the Shinkansen line with the "bullet trains". Since this line was opened in 1964, 800 million passengers have been carried.

Automatic train braking and centralized control assure safety for the bullet trains. A computer-aided traffic-control system adjusts train movements, controls routes, and automatically prepares train diagrams. State-of-the-art technologies in use include statistical maintenance procedures for electrical installations, central supervision and monitoring of field installations, and the use of a high-speed inspection train to measure the dynamic condition of catenaries, track currents, and radio communication links.

Ref. No.: R 11

Safety Categories: 3,4,5,6

Title: Rail Safety/Equipment Crash-  
worthiness  
Vol. I: A Systems Analysis of Injury  
Minimization in Rail Systems

Date: July 1978

Source: NTIS, Report No.  
PB-289 147

Author: M.J. Reilly, R.H. Jines, A.E. Tanner

Organization: Boeing Vertol Co.

Sponsor: TSC/FRA

The Department of Transportation, Transportation Systems Center, ... is providing technical assistance to the Federal Railroad Administration ... in a program to improve railroad safety and efficiency by providing a technological basis for improvement and possible regulation in rail vehicle crashworthiness, inspection and surveillance of equipment, and other areas. As part of this program, TSC is conducting technical analyses of passenger railcar collisions, derailments, and other accidents, directed towards minimizing occupant injuries.

This document, the first of four volumes, reports on the collection of data for a representative accident sample, the analyses of the data to identify injury types, locations, and, when possible, injury causal factors. Vehicle interior design details are also considered in conjunction with the accident data to compile a list of potential improvements in occupant protection... (From author's abstract)

Ref. No.: R 12

Safety Categories: 3,4,5,6

Title: Rail Safety/Equipment Crash-  
worthiness  
Vol. II: Design Guide

Date: July 1978

Source: NTIS, Report No.  
PB-289 148

Author: M.J. Reilly, J. Shefrin, L.M. Patrick

Organization: Boeing Vertol Co.

Sponsor: TSC/FRA

This Design Guide, the second of four volumes, has been prepared to assist design engineers in understanding the basic problems associated with the development of crashworthy interiors of locomotives, cabooses and passenger railcars. Rail vehicle accident conditions are presented with the resulting interactions that can occur between one car and another. Types of injuries to the occupants of the cars, and the mechanism causing the injury, are discussed...(From authors' abstract)

Ref. No.: R 13

Safety Categories: 3,4,5,6

Title: Rail Safety/Equipment Crash-  
worthiness  
Vol. III: Proposed Engineering  
Standards

Date: July 1978

Source: NTIS, Report No.  
PB-289 149

Author: M.J. Reilly

Organization: Boeing Vertol Co.

Sponsor: TSC/FRA

This document, the third of four volumes, contains recommended Engineering Standards prepared in the format of the standards published in the Code of Federal Regulations (Title 49, Transportation, Parts 200). The standards proposed provide improved occupant protection in the secondary impact situation associated with railroad accidents...(From authors' abstract)



Ref. No.: R 14

Safety Categories: 3,4,5,6

Title: Rail Safety/Equipment Crash-  
worthiness  
Vol. IV: Executive Summary

Date: July 1978

Source: NTIS, Report No.  
PB-289 150

Author: M.J. Reilly

Organization: Boeing Vertol Co.

Sponsor: TSC/FRA

This document, the fourth of four volumes, summarizes the activities and documentation conducted under this contract. The analysis of the accident data highlighted areas where improvements could be made to improve the occupant protection of passenger rail vehicles. Design criteria were determined and some suitable design changes proposed. For the proposed areas of change, typical Federal Standards documentation were prepared...(From authors' abstract)

Ref. No.: R 15

Safety Categories: 1,3,4,5,6,7,8

Title: Rail Transit Safety Annual Report

Date: Various

Source: See below

Author: D.M. Daley, E.T. Leonard

Organization: TSC

Sponsor: UMTA

Each Rail Transit Safety Annual Report is a compendium and analysis of rail transit accident/incident and casualty statistics reported by the rail rapid transit properties during the calendar year. The data used are taken from information submitted by rail rapid transit authorities, at the request of the Urban Mass Transportation Administration (UMTA), to the Federal Railroad Administration (FRA) using the Railroad Accident/Incident Reporting System. Beginning in 1981, all reports will be based on information and data submitted to UMTA under its new safety reporting and analysis system.

Light rail transit (LRT) authorities have not been required to report safety information to the FRA. Therefore, no LRT safety data are contained in this report. LRT safety data will first be reported under the new UMTA safety reporting and analysis system.

Source for these Annual Reports is as follows:

1978;1979 - TSC or UMTA  
1980 - NTIS (to be published in 1981)

Similar data for prior years was reported in the FRA Accident/Incident Bulletin; see Ref. A 1.

Ref. No.: R 16

Safety Categories: 5

Title: Rapid Transit--New Use for Hot  
Box Detectors

Date: Aug 1978

Source: Progressive Rail-  
roading, Vol. 21, No. 8  
Aug 1978, pp. 41-44

Author: Progressive Railroading

Organization: Same

Sponsor: NA

Hot box detectors were developed to detect faulty wheels and bearings on railroads. This article describes an effort to adapt them for use by rapid rail transit. The Heated Bearing Detector System includes scanners, snow heater equipment (to prevent snow buildup between tracks) and a system that marks defective wheels with paint.

The system, in use in "an eastern urban center," is described in terms of equipment, initial problems, and its impact on maintenance procedures.

Ref. No.: \*R 17

Safety Categories: 1

Title: Reaction of Materials to Fire

Date: May 3-5, 1979

Comportement Au Feu Des Materiaux

Source: U.I.T.P., International Subway Committee Meeting Proceeding, Stockholm, May 3-5, 1979

Author: M. Sabatier

Organization: R.A.T.P.

Sponsor: NA

This paper presents the results of tests conducted on a variety of electric cables to determine their gas and smoke levels. These tests, initiated by R.A.T.P. in cooperation with a number of French manufacturers, were undertaken to find effective replacements for meeting the newly established safety requirements for French rail transit systems. This report contains tables, illustrations and graphs summarizing test procedures and results.

The paper is written in French, with no English summary.

Ref. No.: R 18

Safety Categories: 3,10

Title: Recommended Prerequisites for  
Replacing CABS with SOR in BART  
Train Control Systems

Date: Aug 1975

Source: NTIS, Order No.  
UCID-3776

Author: D.T. Scalise, D.M. Evans

Organization: University of California, Berkeley

Sponsor: NA

An evaluation is given of the prerequisites for the replacement of the train control system for the Bay Area Rapid Transit (BART).

The sequential occupancy release system (SOR) has several potential advantages for long-range improvement over the currently used computer augmented backup system (CABS): (1) better resolution capability--train occupancy information for more than 1,500 individual blocks can be displayed; and (2) better maintainence capability--an automatic problem reporting system is compatible with the SOR system. SOR will, however, have some shortcomings with respect to certain operational problems, failsafe reliability and failure detection. It is concluded that SOR, used as a backup system, can provide a level of safety comparable to that provided by CABS. (USC Abstract)



Ref. No.: \*R 19

Safety Categories: 1

Title: Reduction of Smoke Emission from  
Telecommunication Cables

Date: May 3-5, 1979

Reduction de L'Emission de Fumee  
des Cables de Telecommunication

Source: U.I.T.P., Inter-  
national Subway Committee  
Meeting Proceedings,  
Stockholm, May 3-5, 1979

Author: G. Bouquet

Organization: R.A.T.P.

Sponsor: NA

This report was presented to a U.I.T.P. International Subway Committee meeting in Stockholm. It gives an explanation of the methodology used as a means to develop smoke emission improvements in materials used in electric cables. The report includes seven tables and charts showing test results.

The paper is written in French, with no English summary.

Ref. No.: \*R 20

Safety Categories: 8

Title: Reflections on the Safety Studies  
of Urban Public Transportation

Date: 1977

Quelques Reflexions sur les  
Etudes de Securite des Systemes  
de Transport en Commun Urbains

Source: R.A.T.P., Documen-  
tation Information 77,  
pp. 5-19

Author: R.A.T.P.

Organization: Same

Sponsor: NA

The author contends that most urban rail transit accidents tend to recur in uniform patterns and often may be avoided by using a systems analysis approach, which he describes. There are sections on safety objectives and on Paris Metro operational statistics which the author considers to be of basic importance to safety evaluation.

The paper is written in French, with no English summary.

Ref. No.: R 21

Safety Categories: 8

Title: Reliability and Availability  
Assessment Criteria, Data Inputs,  
Analysis Methods for Mass  
Transit System

Date: Jan 20-22, 1976

Source: Proceedings, 1976  
Annual Reliability and  
Maintainability Symposium,  
Las Vegas, Jan 20-22, 1976,  
pp. 309-313

Author: E. L. Welker

Organization: TRW, Inc.

Sponsor: NA

The paper presents a list of characteristics for evaluating availability and reliability of a mass transit system. It gives a list of criteria characterized by the author as "fairly complete" for evaluating these characteristics. Interpretation of the results is discussed in the context of management goals.

Ref. No.: R 22

Safety Categories: 8

Title: Reliability Comes to the Transit  
Industry

Date: Jan 20-22, 1976

Source: Proceedings, 1976  
Annual Reliability and  
Maintainability Symposium,  
Las Vegas, Jan 20-22, 1976,  
pp. 309-313

Author: J. H. King, Jr.

Organization: Westinghouse, Transportation  
Division

Sponsor: NA

The paper attempts to "build a common bridge for persons experienced in the assurance science disciplines but new to the transit industry or vice-versa." The author discusses the emerging role of the assurance sciences in transit and suggests how they may need to be adapted for transit applications.

Ref. No.: R 23

Safety Categories: 8,10

Title: Reliability Engineering in Transportation--A Pragmatic Approach

Date: Jan 20-22, 1976

Source: Proceedings, 1976  
Annual Reliability and  
Maintainability Symposium,  
Las Vegas, Jan 20-22, 1976,  
pp. 319-321

Author: H. C. Schwartz

Organization: General Railway Signal Co.

Sponsor: NA

Modern transportation control systems provide a broad range of functions requiring complex electronic equipment. To achieve system performance goals, impacts on reliability and maintainability must be recognized at all stages of system life-cycle: design, manufacture, in-service. Clearly defined organization structure and procedures are necessary to implement this process. (Author)



Ref. No.: R 24

Safety Categories: 3,10

Title: Reliability Improvement of BART  
Train Control

Date: June 1978

Source: NTIS, Order No.  
LBL-8288

Author: D.B. Turner

Organization: Lawrence Berkeley Laboratory  
University of California, Berkely

Sponsor: Department of Energy

Results of a two-year effort of a task group to improve the reliability of the Bay Area Rapid Transit District's vehicle-borne Automatic Train Control equipment are reported. The effort included modifications to the train control equipment designed both by the manufacturer and by the task group. It also included the development and implementation of improved maintenance test procedures and equipment. A significant constraint on this effort was the need to maintain, and where necessary, improve the fail-safe nature of the train control system. Particular attention was paid to reducing the fraction of maintenance diagnoses which resulted in a No Trouble Found report; at the start of the task-team effort, these represented half of the revenue service failures of this system. A substantial improvement in the maintenance capability and decrease in service failures has resulted from this effort.  
(Author)

Ref. No.: \*R 25

Safety Categories: 10

Title: Reliable Microprocessor-Aided  
Design of Intricate Automatic  
Process Systems

Date: Dec 1979

Conception Sure d'Automatismes  
Complexes a Microprocesseurs

Source: Revue Generale de  
l'Electricite, Vol. 88,  
No. 12, Dec 1979

Author: D. Pilaud, G. Saucier

Organization: NA

Sponsor: NA

The proposed design method is a method of progressive specifications. The aim is to obtain the final product (software, hardware) by a sequence of refinements of specifications. The example of the design of an automatic subway pilot is given.

The article is written in French, with no English summary.

Ref. No.: R 26

Safety Categories: 2,3,4,6,7,8

Title: A Report on Investigations into  
Rail Passenger Safety

Date: Oct 1980

Source: NTIS, Report No.  
PB-81-116 196

Author: P.D. Mattison, D.W. Palmer,  
P.R. Nayak

Organization: Arthur D. Little, Inc.,  
Cambridge, MA.

Sponsor: FRA, Office of Rail Safety Research

Investigations are made into issues affecting rail passenger safety in intercity and commuter rail service. The objectives of the study were to identify important safety issues that need resolution, to describe means for resolving these issues, and to describe further research that is critically needed. Special attention was given to those issues highlighted by the National Transportation Safety Board (NSTB) in recent recommendations. The important safety issues identified are briefly described as communications, train control systems, vehicle crashworthiness, vehicle interior design, emergency egress and lighting, equipment maintenance and inspection, and employee training.

Ref. No.: R 27

Safety Categories: 8

Title: A Report on Light Rail Transit:  
Surface Operations. Final Report

Date: Apr 1980

Source: NTIS, Report No.  
PB-80-197 700

Author: NA

Organization: TRB

Sponsor: Same

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. (RRIS abstract, with emphasis supplied.)

Ref. No.: \*R 28

Safety Categories: 1

Title: Research on Prevention of Train  
Fire

Date: July/Aug 1977

Source: Rail International,  
July/Aug 1977, p. 399

Author: T. Takita

Organization: Japanese National Railways

Sponsor: NA

The author, head of the Fire Prevention Laboratory of the Japanese National Railways, has written an extensive description of tests conducted to improve its fire safety system. A number of tables, illustrations and graphs are included.

The paper is written in English.



Ref. No.: S 1

Safety Categories: 3,5,6

Title: Safe Braking Model for a Rail  
Rapid Transit System

Date: 1979

Source: IEEE, Tech. Paper  
79 CH 1454-8 IA

Author: M.C. Becher

Organization: DeLew, Cather and Co.

Sponsor: NA

Safe braking distance is an important consideration in signalling block design for rail rapid transit systems. Historically, block design has developed in accordance with empirically determined stopping distances from various operating speeds plus a safety margin, frequently 35 percent. Because of the impact of poor wheel/rail adhesion and vehicle equipment failures on actual train performance during braking, it became necessary to use a more comprehensive and scientific technique for determining safe braking distance requirements for block design. The safe braking model is an analytic approximation of the performance of automatic train protection equipment, its interaction with passenger vehicle propulsion and braking equipment, and the resulting train performance while decelerating from an initial speed to a stop. The safe braking model considers performance parameters of train control equipment, certain wayside and vehicle characteristics, and performance parameters of vehicle subsystems, and it provides an analytic tool for evaluating the impact of each on safe braking distance. In order to achieve a high level of confidence in the safe braking distance calculations, the safe braking model must be conservative, considering failure modes and worst-case equipment performance parameters which can affect train braking. This paper describes the safe braking model in terms of a train speed-distance profile during braking. The safe braking distance is described in terms of vehicle characteristics and components of the speed-distance profile. Input parameters required to define each component of the safe braking distance are identified, the safety impact of each is discussed, and typical values are presented. (Author)

Note: This paper was presented at the 1979 Joint ASME/IEEE/AAR Railroad Conference held April 12-14 1979, Colorado Springs, Colorado.



Ref. No.: S 2

Safety Categories: 3,10

Title: Safe Train Separation in  
Modern Rapid Transit Systems

Date: July 14-18, 1975

Source: American Society of  
Mechanical Engineers,  
Report No. ASME 75-ICT-11  
(Paper given at Intersociety  
Conference on Transportation,  
Atlanta, Georgia, July 14-18,  
1975)

Author: Paul Kalra

Organization: NA

Sponsor: NA

Automatic control systems must maintain safe spacing between trains under all operating conditions. This article describes a computer simulation model of train performance including correction terms and a short discussion of its application.

Ref. No.: S 3

Safety Categories: 8,10

Title: Safety and System Assurance  
Resources Applied to the Design and  
Development of a Rail Rapid Transit  
System

Date: Oct 17-21, 1977

Source: Third International  
Safety Conference Proceedings  
Oct 17-21, 1977 (System Safety  
Society) pp. 687-697

Author: W. E. Gooden, A. M. Lock

Organization: Parsons, Brinkerhoff, Quade  
and Douglas, Inc./Tudor  
Engineering Co.

Sponsor: MARTA

This paper gives an overview of the program plans for MARTA's Safety and System Assurance Program. The overall program is designed as a "closed loop" to ensure that safety and system assurance features are designed in, built in, and verified before revenue service begins. Separate comprehensive program plans have been developed for the components of the program, e.g., system safety, reliability, and maintainability. The report lists and describes the tasks involved in each of the comprehensive plans.

Ref. No.: S 4

Safety Categories: 8

Title: Safety and System Assurance Reviews Date: See Below

Source: UMTA, Office of  
Safety and Product  
Qualification

Author: UMTA, Office of Safety and Product  
Qualification

Organization: Same

Sponsor: NA

These reports outline the findings of a Safety and System Assurance Program Review Team for each of the properties listed.

1. Safety and System Assurance Review of the Maryland Mass Transit Administration Baltimore Rail Rapid Transit System Development Program, November 28-30, 1977. Published March 1978.
2. Safety and System Assurance Review of the Metropolitan Atlanta Rapid Transit Authority (MARTA) Rail Rapid Transit System Development Program, March 17-21, 1975. Published April 1975.
3. Safety and System Assurance Review of the WMATA Rail Rapid Transit System Development Program. Published March 1977.
4. Safety and System Assurance Review of the Metropolitan Atlanta Rapid Transit Authority (MARTA) Rail Rapid Transit System Development Program, May 16-18, 1977. Published September 1977.
5. Safety and System Assurance Review of the Niagara Frontier Transportation Authority Rail Development Program, July 12-13 1978. Published April 1979.
6. Safety and System Assurance Review of the Metropolitan Dade County Transportation Improvement Program as conducted on March 29-31, 1978. Published July 1978.
7. Safety and System Assurance Review of the Niagara Frontier Transportation Authority Rail Development Program, April 16-17, 1980. Published July 1978.

Ref. No.: S 5

Safety Categories: 8

Title: Safety and System Assurance Study

Date: Sep 78

Source: NTIS, Order No.  
PB-295 523/5ST

Author: Booz, Allen and Hamilton,  
Inc., Transportation  
Consulting Division

Organization: Same

Sponsor: Chicago Transit Authority

The report contains the results of a study of safety and systems assurance-related technical management practices and processes of the Chicago Transit Authority rail system. The study involved an evaluation of technical management practices associated with system safety, equipment reliability/maintainability, system availability/dependability, and quality assurance. Special studies of human factors and train protection were also performed. While the overall scope of the project was broad, the primary objective was to develop and recommend improvements in safety and systems assurance technical management process and practices. (RRIS)

Ref. No.: S 6

Safety Categories: 8,10

Title: Safety/Availability Study Methods  
Applied to BART

Date: Jan 28-30, 1975

Source: Proceedings, 1975  
Annual Reliability and  
Maintainability Symposium,  
Washington, Jan 28-30, 1975,  
pp. 269-275

Author: Everett L. Welker, Hal N. Buchanan

Organization: TRW, Inc.

Sponsor: BART

The paper describes the computer model which TRW developed for performing availability analysis and reliability analysis for the BART System.

Ref. No.: \*S 7

Safety Categories: 3,10

Title: Safety By Redundancy

Date: Nov 1979

Source: Railway Engineers  
International, Vol. 5,  
No. 6, Nov 1979

Author: D.J. Norton

Organization: NA

Sponsor: NA

A redundant arrangement (two out of three decisions system) is evaluated for its safety potential in signalling systems from a theoretical standpoint. The basic principles essential to attaining an adequate safety level are discussed. Success in utilizing this technique will depend upon the reliability of components and an understanding of the philosophy of employing redundancy in railway systems. The experience of the nuclear industry with redundancy techniques is cited.

The article is written in English.



Ref. No.: S 8

Safety Categories: 1,2,6,7,8

Title: Safety Effectiveness Evaluation  
of Rail Rapid Transit Safety

Date: Jan 22, 1981

Source: NTIS, Report No.  
PB-81-159 188

Author: NA

Organization: NTSB, Office of Evaluations  
and Safety Objectives

Sponsor: Same

On July 28 and 29, 1980, the National Transportation Safety Board held a public hearing on rail rapid transit safety. Twenty-five witnesses testified during the hearing on fire safety issues, emergency evacuation from rail rapid transit systems and safety oversight of transit systems. The Safety Board examined fire safety issues involving transit car design; emergency exit from cars; emergency tunnel ventilation; evacuation from tunnels; emergency procedures including training, drilling, and testing; emergency communications, equipment, and mobility; and local/state/federal safety oversight of rail rapid transit properties.

The Safety Board issued urgent recommendations to the Urban Mass Transportation Administration for a survey of rail rapid transit systems to determine their capability for evacuation of passengers under various operational and passenger load conditions and to establish federal guidelines for the elimination or minimization of combustible and toxic gas and smoke-generating materials in existing rail rapid transit cars. The Safety Board further recommended that the Secretary of Transportation propose federal legislation which would explicitly authorize the establishment of safety standards for rail rapid transit systems. Other recommendations seek federal guidelines for car and tunnel designs, safety equipment, and training; the need for 5-year safety and research and development plans; a fire research and testing program; a study of the need for fire suppression systems; and improved training for tunnel rescue efforts for employees and emergency personnel. (Author)

Ref. No.: S 9

Safety Categories: 8

Title: Safety Estimates for Urban  
Transit Systems

Date: Sep 16-19, 1975

Source: Colorado University,  
Center for Urban Transporta-  
tion Studies, Denver, Color-  
ado, 80202 (Conference  
Papers, Vol. 2, Paper 43)

Author: D. Morag, T.J. McGean

Organization: DeLeuw, Cather and Company

Sponsor: Colorado University

The paper presents the methodology and results of the safety analysis conducted for each of the transit alternatives being considered for Denver, Colo. It contains the historical data, methodology, and various assumptions used to develop the appropriate accident and accident severity rates to forecast the safety status of various transit alternatives for the year 2000. The expected accident rates for the various concepts are summarized by hazard category and by the system's section. The comparison of total annual fatalities for the concepts is presented in terms of lives saved. The line haul sections of various concepts, and typical auto fatality rates are also compared to the domestic scheduled airline annual fatality rate. (RRIS)

Ref. No.: \*S 10

Safety Categories: 8

Title: Safety in its Technical Aspect and  
in the Aspect of User Behavior

Date: June 4-8, 1973

La Securite du Point de Vue Tech-  
nique et du Point de Vue de Com-  
partment des Usagers

Source: Colloque Interna-  
tional des Techniques de  
Point dans les Transports  
de Surface: Methods Nouvelles  
Pour 'L'Exploitation des  
Techniques Classiques. Pro-  
ceedings, Vol. 3. Available  
from Transport-Expo, 8, Rue  
de la Michodiere, 75002,  
Paris, France

Author: Transport-Expo

Organization: Same

Sponsor: NA

This volume contains six papers on urban transportation safety. Four of these papers deal with safety in urban rail transit systems:

Major Problems and Future Evolution of Safety in Railway Transportation; by M. Cesari, Chemins de Fer Italiens.

The Contribution of Research to the Evolution of the Concept of Safety - The Probabilistic Approach, by M. Gabillard, Professeur a l'Universite de Lille.

Safety in Urban Transport Systems, by M.J.K.C. Henderson, London Transport.

A Study of Safety in Transports, by M. Wanner.

The assessment of potential dangers in urban rail systems and a solution to these problems is discussed in the papers. The consensus is that a trained employee should be on board rail vehicles to ensure maximum safety in case of breakdown in the electronic equipment. M. Gentil, the director general of the S.N.C.F., comments on the contents of papers in the conclusions.

The papers are written in French, with English and German summaries.

Ref. No.: S 11

Safety Categories: 8

Title: Safety in Urban Mass  
Transportation: Guidelines  
Manual and Research Report  
Summary

Date: Mar 1976

Source: NTIS, Order No.  
PB-245 413/OST

Author: E. S. Cheaney, J. A. Hoess,  
R. E. Thompson, R. L. Svehla

Organization: Batelle Columbus Laboratories

Sponsor: UMTA

An investigation was carried out with the purpose of providing information and reporting the results of analyses about the current level of safety and the need for additional safety effort in urban mass transit. The Research Report Summary outlines the steps followed in the investigation, and serves as an introduction to the final report which contains a full presentation of data on the safety performance of all passenger transportation modes... The guidelines manual presents a series of organizational and technical safety guidelines designed for use of the transit management community. The guidelines are intended to show how the transit industry--supplier firms and operators--can develop programs that will assure satisfactory operational safety levels... The manual covers the following topics in separate chapters: foundations of safety in urban mass transportation; safety management and planning; techniques for safety analysis; trade-off considerations; system safety data base; safety standards and specifications; and intermodal interface safety considerations. These guidelines are in the form of suggested or recommended practices accompanied by explanation. They are designed to have a considerable latitude of user interpretation so they can fit the wide variety of specific situations found in the transit industry. (From RRIS abstract)



Ref. No.: S 12

Safety Categories: 10

Title: Safety or Reliability -  
Must We Choose?

Date: Nov. 15, 1979

Source: AIAA Monographs, Vol. 25  
(1979), pp. 19-23

Author: F.R. Needels

Organization: Community Redevelopment Agency

Sponsor: NA

The transit industry has traditionally depended upon fail-safe design techniques and practices to achieve safety in the application of its control and communications systems. The ability to produce a reliable design using these techniques is somewhat limited, particularly as the level of automation increases. The aerospace industry has provided safety in the systems they have developed through disciplined programs of hazard analysis and risk assessment, combined with design techniques which enhance the reliability of the systems. It would appear that an amalgamation of some of these techniques and practices into the transit design processes holds some promise of helping to provide reliable automated ground transportation while maintaining the safety of the riding public at an acceptably high level. (RRIS)

Note: This paper was given at the Aerospace Technology Workshop, Los Angeles, California, November 15, 1979.

Ref. No.: S 13

Safety Categories: 1,2,7,8

Title: Safety Priorities in Rail Rapid  
Transit

Date: Mar 1975

Source: NTIS, Order Nos.  
PB-242 953 and PB-242 954

Author: W. M. Connell

Organization: Transit Development Corp.  
Inc., 1730 M. Street NW,  
Washington, D.C. 20036

Sponsor: UMTA

The report describes TDC's development of a safety program for the RRT industry. Program priorities were determined by working with representatives of the transit industry. The effort was completed in early 1975. TDC concentrated on fire hazard, patron safety, and operation safety. They identified a need for a major effort in fire-related research. In the area of patron safety, fixed stairs were of primary concern. In operational safety, evacuation and regeneration were to receive priority.



Ref. No.: S 14

Safety Categories: 1,3,8,10

Title: The Safety Program for the  
Baltimore Region Rapid Transit  
System

Date: Oct 17-21, 1977

Source: Third International  
Safety Conference Proceedings,  
Oct 17-21, 1977 (System Safety  
Society) pp. 699-714

Author: H. Hunt

Organization: Daniel, Mann, Johnson, and  
Mendenhall/Kaiser Engineers

Sponsor: Baltimore Region Rapid Transit

The paper describes the system safety effort of the Maryland Mass Transit Administration in designing the Baltimore RRT System. The author points out that similar efforts began relatively late in the development of BART and METRO and briefly discusses the problems caused by this delay. Fire protection and security design considerations are discussed in detail; system safety is covered in general terms. The fire protection section outlines the criteria and standards to be used in designing the system and explains how they were operationalized. The system safety section describes initial plans for using automatic train control in the system.

Ref. No.: \*S 15

Safety Categories: 8

Title: Safety Psychology: A Review  
of the Literature

Date: 1977

Source: Aston University,  
Gosta Green, Birmingham B4  
7ET, England, Department of  
Applied Psychology (R&D  
Report AP 35)

Author: J. Donn

Organization: Aston University

Sponsor: NA

The major concepts and trends in safety psychology are reviewed under four headings in this paper: (1) personal factors affecting caution of accidents; (2) environmental factors affecting accident causation; (3) theories in safety psychology; (4) research problems in safety psychology. The major conclusion reached is that a theoretical framework, for bringing available safety information into a usable form for predicting accidents before they occur, is lacking in the field of safety psychology.

The report is written in English.

Ref. No.: \*S 16

Safety Categories: 3

Title: Safety Stops at Terminals  
Evaluated

Date: Jan/Feb 1978

Source: International Mech-  
anical Engineering,  
Jan/Feb 1978

Author: International Mechanical Engineering

Organization: Same

Sponsor: NA

Buffer-stop collisions account for fifteen per-cent of all serious train accidents and for forty per-cent of all serious passenger casualties. Godwin Warren Engineering Limited and Osnabruck, manufacturers of friction-type buffer-stop, sponsored a one day seminar, which was held in London during November of 1978, that focussed on evaluating various means of stopping trains in emergency situations. This article summarizes the contents of the seven papers read at the seminar by various transportation experts.

The article is written in English.

Ref. No.: \*S 17

Safety Categories: All

Title: Safety Study for System Val

Date: 1975

Etudes De Securite De System  
De Transports Val

Source: Engins MATRA  
4 Rue de Presbourg 75116  
Paris, France

Author: Engins MATRA

Organization: Same

Sponsor: NA

This detailed report presents a synthesis of a number of safety-focussed studies that describe the Lille Metro system (VAL). In the VAL system, trains circulate on a track without onboard control personnel. Safety was viewed as the prime consideration in the design of this system, since operating personnel are generally inaccessible to passengers.

The report begins with incremental descriptions from a safety perspective of the technical characteristics and functions of the system's rolling stock, stations, and automatic and mechanical equipment. The second chapter describes the safety arrangements of the VAL system, including excess speed safety devices, emergency brake logic, anti-collision safety device, the control of mode by safety frequency and safety remote controls, door safety, and traction safety. The third chapter offers an evaluation of the studies conducted on VAL safety system design. The fourth chapter primarily concentrates on the typology of accidents. Electrocutions, suffocations, asphyxiations, suicides, and crushed victims are among the types of accidents analyzed. The fifth chapter follows with a view of the management procedures for on-the-line accidents, and lists the safety measures for emergency situations. The sixth chapter contains statistical data.

The report is written in French, with no English summary.

Ref. No.: \*S 18

Safety Categories: 3,6,10

Title: Safety System for Train  
Operations

Date: Jan 1977

Source: Japanese Railway  
Engineering, Vol. 17,  
No. 1, 1977, p. 4

Author: K. Iwasa

Organization: Japanese National Railways

Sponsor: NA

Summarizes the development of signaling devices used by the JNR. The article also mentions the automatic braking systems used in passenger lines by the JNR. Automatic train control allows the driver to maintain control over the service brakes when operating at normal speed, but come into play automatically when the speed becomes excessive.

The article is written in English.



Ref. No.: \*S 19

Safety Categories: 1

Title: Search for Electric Cables with  
Low Noxious Pyrogenation and  
Combustion for the Subway In Lyon

Date: May 3-5, 1979

Recherche de Cables Electriques  
a Pyrogenation et Combustion de  
Faible Nocivite Pour le Metro de Lyon

Source: U.I.T.P., International  
Subway Committee Meeting Pro-  
ceedings, Stockholm,  
May 3-5, 1979

Author: E. Luca

Organization: Societe d'Economie Mixte du Metropolitain  
de L'Agglomeration  
Lyonnaise (S.E.M.A.L.Y.)

Sponsor: NA

The Lyon Metro conducted a number of studies on the gas emission and fire generation properties of a variety of insulating materials used in electric cables. This report, which was presented to a UITP sub-committee, consists of several graphs and tables with a short introductory paragraph summarizing the test methods and results.

The report is written in French, with no English summary.

Ref. No.: S 20

Safety Categories: 3,10

Title: Simulators Used By WMATA

Date: May 27-30, 1979

Source: IEEE, 29th Vehicle  
Technology Conference Record

Author: M. Lukes

Organization: WMATA

Sponsor: NA

The Washington Metropolitan Area Transit Authority rail transit system utilizes computer technology in many areas. Simulation is used in day to day operations of Metro. A train movement simulator is presently used to assist in calculating schedules and to minimize delay causing conflicts at locations where trains vie for the same track. In the future this simulator may be utilized to verify strategies and parameters used by the automatic train supervision system and the central control supervisors to control schedule disruptions. Brief descriptions are given of the Train Movement/Transit System Simulator, the Simulation of Operations Program (SOP) used to verify the Central Computer System software and the circuit simulator which is a program designed to check the operation of interlocking circuits. (Author)

Ref. No.: \*S 21

Safety Categories: 1

Title: Smoke and Fire at Fixed  
Electrical Installations

Date: May 3-5, 1979

Source: U.I.T.P., International  
Subway Committee Meeting Pro-  
ceedings, Stockholm,  
May 3-5, 1979

Author: L. Almquist

Organization: Storsstockholm Lokaltrafik

Sponsor: NA

A two page report giving an account of fires in the Storsstockholm Lokaltrafik. More than sixty per-cent of the major fires were set by passengers traveling on the underground system. Four tables give the particulars of the fires.

The report is written in English.

Ref. No.: \*S 22

Safety Categories: 1,6

Title: A Solution to Train Fires

Date: Jan 1975

Source: Japanese Railway Engineering, Vol. 16,  
No. 1, 1975, p. 4

Author: T. Tanaka

Organization: Japanese National Railways

Sponsor: NA

This article discusses the results of tests conducted over two and a half years by the Japanese National Railways. (A high casualty train fire inside a 14km tunnel stimulated this research effort.) The tests consisted of running a series of ignited trains in tunnels and open lines. There are four important findings in the test conclusions:

1. In a three car ensemble when the middle car is on fire in a tunnel, the fire has a minimal effect on the front car and a maximum effect on the rear car.
2. Ignited trains can run to escape tunnels.
3. All ventilation sources such as doors and windows, should be tightly closed during fires, to prevent oxygen from feeding the fire.
4. Fire-resistant trains are a necessity in all rail systems, to prevent high casualties during fires.

The article is written in English.

Ref. No.: \*S 23

Safety Categories: 1

Title: Status of the Studies Conducted  
by the R.A.T.P. in Cable  
Improvements

Date: May 3-5, 1979

Bilan des Recherches Effectuees  
a la R.A.T.P. Concernant l'Am-  
elioration Des Cables

Source: U.I.T.P., Interna-  
tional Subway Committee  
Meeting Proceeding, Stockholm,  
May 3-5, 1979

Author: M. Sabatier

Organization: R.A.T.P.

Sponsor: NA

Pryotenax cables have a number of drawbacks such as a high percentage of faulty insulation, damage due to salt water seepage, and costly and delicate installation. The R.A.T.P. commissioned several French cable manufacturers to develop a design for a new cable to replace the Pryotenax cables currently in use in the RAPT system. Research was conducted under two specific guidelines;

1. To design a safety cable with the positive attributes of the Pryotenax cable with its drawbacks eliminated, fire-resistant up to 900 celsius for one hour under 500 volts.
2. To design a non-fire propagating multi-purpose cable which does not release smoke or toxic gases.

Connections and circuit breakers were also to be designed to complement the fire-resistant qualities of the newly developed cables. Three cables (unnamed in this report) achieved the specifications needed for the safety cables, and two met the smoke and gas emission standards for the multi-use cables.

The report is written in French, with no English summary.



Ref. No.: \*S 24

Safety Categories: 1,6,7

Title: Storsstockholm Lokaltrafik:Report

Date: May 3-5, 1979

Source: U.I.T.P., International  
Subway Committee  
Meeting Proceedings,  
May 3-5, 1979

Author: E. Lagerberg

Organization: Storsstockholm Lokaltrafik

Sponsor: NA

This short report lists the number and causes of all electrical fires in the Stockholm Metro System. Special attention has been given to fires starting in escalators.

The report is written in English.

Ref. No.: \*S 25

Safety Categories: 1,6,7,8

Title: Study of Fires In Subway Systems

Date: May 1976

Problematica sugli Incendi nell'  
Esercizio Metropolitano

Source: C.E.R.T.U.M.

Author: Azienda Trasporti Municipali  
Milano

Organization: Same

Sponsor: NA

This detailed study reviews the principal causes of a devastating fire that took place in the Montreal Subway System during 1974. A comparison of the fire fighting and evacuation procedures is made between the Montreal system at the time period of the accident and the various international subway systems. In this comparison the Montreal system was described as deficient in some areas of fire safety and prevention, such as lack of water sources within the stations and tunnels, training of personnel in the proper operational procedures during fires, and inadequate numbers of fire extinguishers. The methods used to prevent and combat large-scale fires in a number of international subway systems are described in this report.

The report is written in Italian, with no English summary.

Ref. No.: S 26

Safety Categories: 1,2,8,10

Title: Subway Environmental Design  
Handbook, Volume I: Principles  
and Applications, Second Edition

Date: Mar 1976

Source: NTIS, Order No.  
PB-254 788

Author: NA

Organization: Transit Development Corporation, Inc.  
1730 M Street, N.W.  
Washington, D.C. 20036

Sponsor: UMTA

This Handbook is a guide and reference for the planning, design, construction and operation of environmental control systems for underground rapid transit. The Handbook follows the engineering sequence from criteria through load analysis, and from system conceptual design to selection of equipment. It covers a broad range of parameters, including temperature, humidity, air quality and rapid pressure change and, to a limited extent, noise and vibration as related to environmental control equipment. (From authors' abstract)

Section 3.5 of the Handbook, entitled "Environmental Control for Emergencies," deals with the problem of smoke in tunnels.

Ref. No.: \*S 27

Safety Categories: 10

Title: System Assurance in a Rapid  
Transit System

Date: Oct 13-14, 1977

Source: Society of Reliability  
Engineers, Fourth Annual Canadian  
Symposium on Reliability Engin-  
eering, Ottawa, Canada, Oct 13-14,  
1977. pp. 165-172

Author: A. H. K. Ling

Organization: Urban Transportation Development  
Corp., Ltd., Toronto, Canada

Sponsor: NA

A transit system must have a high degree of vehicle reliability in order to transport passengers in a reliable, timely, economic, and comfortable manner according to a specified schedule. The paper discusses the rapid transit reliability concepts, requirements, terminology, plans and methodology necessary to fulfill the reliability and maintainability (R&M) functions with an ultimate objective of ensuring optimal results in system development and design. Elements of R&M programs are identified and discussed along with engineering and management elements. Reliability mathematics is briefly highlighted. The transit system reliability considers both hardware and software. (Author)

The paper is written in English.

Ref. No.: S 28

Safety Categories: 8

Title: System Safety Program Plans

Date: Various

Source: UMTA, Office  
of Safety and Product  
Qualification

Author: NA

Organization: See below

Sponsor: UMTA

System Safety Program Plans were written during their development phase by the following transit systems:

Metropolitan Atlanta Rapid Transit Association  
Metropolitan Dade County Transportation System  
Baltimore Region Rapid Transit System  
Buffalo Transit System

Approved Operational System Safety Program Plans exist or are under development for:

Greater Cleveland Regional Transit Authority  
Port Authority Transit Corporation  
Port Authority Trans-Hudson Corporation  
Bay Area Rapid Transit District  
Washington Metropolitan Area Transportation Association  
Chicago Transit Authority  
Massachusetts Bay Transit Authority  
New York City Transit Authority  
Southeastern Pennsylvania Transit Authority  
San Francisco Municipal Railway  
Port Authority of Alleghany County

The safety program plan for the Baltimore Region Rapid Transit System has been discussed in the open literature and is reported as item S 11 of this Bibliography. The other program plans have not been discussed or published in the open literature.



Ref. No.: S 29

Safety Categories: 8

Title: System Safety/Risk Analysis  
Techniques Applied to Motor Vehicles  
and Rapid Transit Systems

Date: Mar 1977

Source: Journal of Safety  
Research, Vol. 9, No. 1,  
Mar 1977, pp. 2-14

Author: J. A. Mateyka, J. Talley

Organization: Booz, Allen & Hamilton, Inc.

Sponsor: Dade County, Florida

The article summarizes Booz, Allen & Hamilton, Inc.'s application of fault tree analysis logic to three modes: auto, bus, and rapid transit. The firm performed the RRT work as part of the preliminary development of Dade County's planned Rapid Transit System. They developed safety criteria for use during the system's design and construction and a System Safety Program Plan for its development and operation.

Data on accidents was obtained from existing systems in North America. Information on frequency and severity of different accident types was summarized into a criticality index. The resulting generic fault tree is presented as a way to identify key safety problems in the absence of accident cost data. This index was used to set safety priorities for system design.

Ref. No.: \*T 1

Safety Categories: 3,5,10

Title: Teloc-E: A New Electronic Speed  
and Distance Measuring System for  
Railways

Date: 1976

Source: Hasler Review,  
Vol. 9, No. 2, Summer 1976, p. 1  
(Hasler A. G., Belpstrasse 23,  
CH 2000, Berne 14,  
Switzerland)

Author: E. Winkler

Organization: Hasler A.G.

Sponsor: NA

This article contains a technical assessment of the Teloc-E system layout. Components, systems functions, and characteristics are reviewed. Diagrams representing Teloc-E safety concept for installations with continuous train controls and the systems principles and functions supplement the text. The redundancy technique for this system is explained.

The article is written in English.

Note: See also Refs. \*T 2 and \*N 1

Ref. No.: \*T 2

Safety Categories: 3,5,10

Title: Teloc-E Hybrid Systems

Date: 1979

Source: Hasler Review,  
Vol. 12, No. 1, Spring 1979, p. 9  
(Hasler A.G., Belpstrasse  
23, CH 3000, Berne 14,  
Switzerland)

Author: A. Alleman

Organization: Hasler A.G.

Sponsor: NA

The Marseille, Lyon and Paris subway systems use electronic railway systems that measure, control, display and register velocity by using hybrid digital analog technology. Velocity thresholds control external devices such as automatic door openers, door locking and unlocking devices, and brake pressure switches. Technical descriptions of systems characteristics and functions are augmented by tables, graphs and illustrations. The safety aspects of the system are discussed in full.

The article is written in English.

Note: See Refs. \*T 1 and \*N 1

Ref. No.: \*T 3

Safety Categories: 1

Title: Test Procedures for the Inflammability of Electrical Cables

Date: May 3-5, 1979

Procédures d'Essai pour  
Déterminer la Résistance  
au Feu des Câbles Électriques

Source: U.I.T.P., International  
Subway Committee  
Meeting Proceedings,  
Stockholm, May 3-5, 1979

Author: Groupe de Travail Pour la  
Protection Contre les Risques  
d'Incendie des Câbles Élec-  
triques Utilisés dans METRO

Organization: Same

Sponsor: NA

A thirteen page report describing methods of evaluating the inflammability characteristics of insulating materials used in electric cables.

The report is written in French, with no English summary.

Ref. No.: \*T 4

Safety Categories: 2,8

Title: Tokyo Underground Station and its  
Disaster Prevention System

Date: 1973

Source: Japanese Railway  
Engineering, Vol. 14, No. 2,  
1973, pp. 9-14

Author: E. Atsushi

Organization: Japanese National Railways

Sponsor: NA

Every Japanese subway station has a in-house disaster prevention center or one at its disposal. This article explains: the station layout; the counter-measures pursued for each type of potential disaster; the procedures involved in operating during hazardous incidents; and the equipment used in stabilizing disastrous situations.

The article is written in English.

Ref. No.: T 5

Safety Categories: 3

Title: Track-Guided Radar for Rapid  
Transit Headway Control

Date: Aug 1975

Source: Journal of Aircraft,  
Vol. 12, No. 8, Aug 1975,  
pp. 676-681

Author: A.D. McAulay

Organization: The Boeing Corporation

Sponsor: NA

A guided radar system is outlined which is suitable for collision avoidance and headway control in future high capacity systems, and a method is proposed in which the track is adapted for use as a radar wave guide. Present high-frequency systems are reviewed for comparison. A numerical procedure, involving a generalization of the finite element method using the method of weighted residuals, is developed for determining the propagation constants for surface waves along lossy waveguides of arbitrary shape such as the track waveguide. (Author).



Ref. No.: T 6

Safety Categories: 3

Title: Traffic Control Measures at Highway  
Railway-Grade Crossing with  
Provisions for Light Rail Transit

Date: 1977

Source: TRB, Research Record  
No. 628, Lighting, Visibility,  
and Railroad-Highway Grade  
Crossings, pp. 6-11

Author: J. Schnablegger, S. Teply

Organization: Edmonton Transportation  
Planning Branch; Alberta  
University

Sponsor: NA

Railway rights-of-way in cities are attractive alternatives for transit corridors, but for modes that are not fully grade-separated, such as light rail transit systems, there may be problems with combined railway and transit crossings of arterial streets. This situation has been studied in Edmonton, Alberta, where a light rail transit line is under construction. The surface portion of this line is along the railway right-of-way, and as a result, the operation of its eight grade crossings is regulated by railway authorities. The short headways of light rail transit could cause frequent disturbances to the road traffic that operates at a saturation during peak hours. This paper illustrates the method used for the analysis of the problem and discusses the surveys conducted. The basic principles governing the solutions to the grade-crossing problem are (a) the coordination of adjacent signalized intersections in such a way that the impact of the crossing closure is minimized and the system recovers shortly after the closure, (b) the integration of light rail transit scheduling and control with traffic control, i.e., restricting the closures to the periods of minimum impact on road traffic, and (c) the use of special features to increase safety. (Author)

Ref. No.: \*T 7

Safety Categories: 3,10

Title: Traffic Control Systems for  
Railways

Date: Aug 1976

Source: Hitachi Review,  
Vol. 25, No. 8, Aug 1976  
(Hitachi Limited #4-1  
Marunouchi, Tokyo, Japan)

Author: Y. Kawai, Y. Kubo, H. Oshima,  
S. Kariya, S. Kobayashi

Organization: Hitachi Limited

Sponsor: NA

Railways in Japan are shouldering ever-growing responsibilities as a means of public conveyance. Urban traffic particularly for commuters is expected to increase further in density. Consequently, speedier and more accurate operations are required for train traffic. And to secure safe and smooth transportation, new systems will be needed. Against such a background, this paper describes the latest results in computer-aided traffic control systems and outlines a few newly developed systems. (Authors)

The article is written in English.

Ref. No.: T 8

Safety Categories: 7

Title: Transit Station Planning and  
Design: State of the Art

Date: Apr 1976

Source: NTIS, Order No.  
PB-275 279

Author: L. A. Hoel, E. S. Roszner

Organization: Transportation Research Institute,  
Carnegie-Mellon University

Sponsor: National Science Foundation  
Research Applied to National  
Needs (RANN)

The objectives of this research were to: (1) delineate the current practice of urban transit interface planning and design; (2) identify major weaknesses and suggested improvements in facility design methodology; and (3) identify critical areas of research needs. The two major tasks undertaken in pursuing these objectives were a literature search and a professional conference. The report is divided into three parts. Part 1 reports on an extensive review of the literature. Part 2 contains papers that were presented at a conference session focusing on current practice and experience with planning and designing transit stations, and a resource paper that was presented at a session dealing with research needs and new transit station design techniques. Part 3 summarizes the discussions that followed the presentation of papers at these two sessions, and presents findings and conclusions. (Author)

Ref. No.: T 9

Safety Categories: 1, 10

Title: Transit Vehicle Material  
Specifications Using Release  
Rate Tests for Flammability  
and Smoke

Date: Oct 1976

Source: NTIS, Order No.  
PB-262 895/6ST

Author: E.E. Smith

Organization: Ohio State University

Sponsor: Transit Development Corporation; American Public  
Transit Association

The report relates to two of the most important features in fire safety design of a transit vehicle's interior finishes and furnishings: to allow time for evacuation and prevent a self-propagating fire. Comparative evaluation of fire performance of a fire system (as contrasted with the evaluation of the individual materials in the system) are discussed in terms of a model in which the interdependence of materials and the system are mathematically simulated to give an absolute ... evaluation of a fire system and to predict what limits on loading will prevent fully developed fires in a specific situation. (RRIS)

Ref. No.: T 10

Safety Categories: 6,7,8

Title: Transportation Safety Information  
Report (Quarterly)

Date: 1974 to present

Source: See below

Author: W.F. Gay

Organization: TSC

Sponsor: DOT, Office of Safety Affairs  
(through third quarter 1979);  
DOT, RSPA, Office of Policy,  
Plans, and Administration (currently)

The TRANSIS system at TSC makes data and information on safety performance and on safety activities in all transportation modes readily available to DOT managers to allow intermodal comparisons. The system contains national data on accidents, injuries, and fatalities by month and by transportation mode; with certain exceptions due to limitations within modal accident reporting systems. Data and information are collected from DOT operating elements and published on a quarterly basis, starting with 1974.

Note: Quarterly reports for calendar 1977 and 1978 are available from NTIS, under these numbers:

For 1977: NTISUB/C/224-001, -002, -003, -004

For 1978: NTISUB/D/224-001, -002, -003, -004

Beginning with the first quarter of 1979, the quarterly reports are available by title from the U.S. Government Printing Office, referencing the code letters TSIR.



Ref. No.: T 11

Safety Categories: 8

Title: Transportation System Safety  
Methodology

Date: Nov 1976

Source: NTIS, Order No.  
PB-262 793

Author: M. Horodniceanu, E. J. Cantilli,  
M. Shooman, L. J. Pignataro

Organization: Polytechnic Institute of New York  
333 Jay Street Brooklyn, NY 11201

Sponsor: DOT, Office of University Research

This study is an overview of system safety methodology for all transportation modes. The report is in two sections, one on management and one on development of a safety program. Each section discusses the analytical tools and necessary data for examining management and program issues.

The management section covers organization and staff requirements; procedures for setting policies, objectives and accountability; motivation; and measurement of effectiveness. The system safety program describes an analytical process for developing the program. Analytical techniques and application of the findings to system design are discussed.



Ref. No.: T 12

Safety Categories: 1,2,6,7,8

Title: Tunnel Fire Specter Sparks Many  
Safety Programs

Date: June 12, 1980

Source: Engineering News-Record,  
Vol. 204, No. 24, Jun 12, 1980  
p. 24

Author: Engineering News-Record

Organization: Same

Sponsor: NA

After the major fire in the Transbay tunnel of Bay Area Rapid Transit in 1979, all North American subway systems are giving increased attention to fire prevention and fire fighting. These have included changes in tunnel cables, water supply and venting, in emergency training for transit employees, and in new coordination with municipal emergency services. Two handbooks for design, UMTA's Subway Environmental Design Handbook and APTA's Guidelines for Design of Rapid Transit Facilities, will soon be supplemented by a new water piping standard for fixed guideway transit by National Fire Protection Association. (RRIS)

Ref. No.: \*T 13

Safety Categories: 6

Title: Tyneside Report 8, Part 1:  
Rolling Stock

Date: May 1980

Source: Modern Tramway and Light Rail Transit, Vol. 43, No. 509, May 1980, pp. 150-156. Published by Allan (Ian) Ltd., Terminal House, Shepperton TW17 8AS, Middlesex, England.

Author: P.G. Haywood, J.H. Price

Organization: Modern Tramway and Light Rail Transit

Sponsor: NA

This article is part of a series of three describing: (1) the rolling stock, (2) the construction and (3) the operation of the Tyne and Wear Metro. The Metro is of standard BR width track, using a 1500 volt DC overhead catenary. There will be 90 metro cars used, each with 84 seats per car and a crush capacity of 272 passengers. Opening of the doors installed in a 1.3 M wide aperture will be by passengers after the trainman has operated a door release button at a station. The doors can only be closed by the driver. Superb riding quality has been achieved by the use of an air body suspension and rubber axle suspension. Drivers are able to couple and uncouple metrocars from their cabs without shunters. Control equipment, based on the air/oil camshaft uses automatic acceleration. Braking is mainly rheostatic, supplemented by electro-pneumatic disc brakes and electro-magnetic track brakes. Electronic equipment measuring the speed of each independent axle, protects the car against wheel-spin during acceleration and braking. Safety devices fitted includes a passenger emergency brake and an emergency door handle. (RRIS)

The article is written in English.

Ref. No.: U 1

Safety Categories: 10

Title: UMTA Transportation Planning  
System Reference Manual

Date: June 1975

Source: NTIS, Order No.  
PB-246 187/9ST

Author: NA

Organization: UMTA, Planning Methodology and  
Technical Support Division

Sponsor: Same

Developed by the Urban Mass Transportation Administration, the UMTA Transportation Planning System (UTPS) is a collection of IBM System/360-370 computer programs for use in planning multimodal urban transportation systems. The objective of UTPS is to provide transportation planners with readily available, tested, and easy to use planning tools. This document summarizes information on the function and use of UTPS programs. It discusses general program operation and contains each individual program's operating instructions. This manual also describes all UTPS datasets, and explains how UTPS is installed at a user's computing facility. Sections of the manual include system control statements, subject program control statements, program writeup organization, software system description, data file formats, cataloged procedures, and program writeups. (Author)

Ref. No.: U 2

Safety Categories: 8

Title: Urban Rail Supporting Technology,  
A Five Year Progress Summary  
1971-1976

Date: June 1976

Source: NTIS, Order No.  
PB-259 090/AS

Author: TSC

Organization: Same

Sponsor: UMTA

The report lists and briefly describes the rapid rail transit projects in which TSC was involved between 1971 and 1976.

Ref. No.: U 3

Safety Categories: 4,6

Title: Urban Rapid Rail Vehicle and  
Systems Program

Date: Dec 1979

Source: NTIS, Order No.  
PB80-155 500

Author: D. K. Griffin

Organization: Boeing Vertol Co., Surface  
Transportation Systems Dept.,  
Philadelphia, PA 19142

Sponsor: UMTA

The main objective of the program was to make rapid rail transportation more attractive to the urban traveler by providing existing and proposed transit systems with service that is comfortable, reliable, safe, and as economical as possible. The short-range goal was the demonstration of the state of the art in rapid rail vehicular technology; the long-range goal was the development and demonstration of improved vehicles. The State-of-the-Art Car (SOAC), incorporating the latest transit railcar technology, was developed and tested. The two cars fabricated were demonstrated in revenue service on six transit properties. (Author)

Note: See also Ref. A 2.

Ref. No.: W 1

Safety Categories: 3,10

Title: Washington Metro ATC System

Date: 1977

Source: IEEE, Technical  
Paper No. 77 CH 1237-71A,  
pp. 42-48

Author: R. H. Sheldon

Organization: WMATA

Sponsor: NA

Automatic Train Control (ATC) as used by the Washington Metro consists of three integrated subsystems, with each performing its separate function. The three: Automatic Train Protection (ATP), Automatic Train Operation (ATO), and Automatic Train Supervision (ATS). The computer controlled fully automatic train control and its components are described. (Author)



Ref. No.: W 2

Safety Categories: 1

Title: With Low Smoke, Toxicity,  
Burning Rate, Can Plastics  
Fill Aircraft and Transit Needs?

Date: Aug 76

Source: Materials Engineering  
Vol. 84, No. 2, Aug 1976,  
pp. 20-22

Author: A. M. Houston

Organization: NA

Sponsor: NA

Government pressure,....., in the form of guidelines, proposed rules and actual requirements, is forcing companies building airplanes, subways and buses to look for materials that provide better burning characteristics. A number of plastics producers either have announced or are planning to announce grades that are substantial improvements over existing ones for paneling, seating and glazing. The question is, are these plastics adequate? Beyond this question, extensive research in many areas such as toxicity may change existing requirements and thus again the status of materials being considered. (RRIS)

APPENDIX - SOURCES CONSULTED IN  
COMPILING THIS BIBLIOGRAPHY

U.S. Sources

For rail transit safety work in the U.S., there is a well developed set of information channels. The following sources were examined to identify published documents on rail transit safety:

Government Data Bases

1. Urban Mass Transportation Administration, Abstracts.
2. Railroad Research Information Service, special computerized literature search.
3. NASA Scientific and Technical Information Facility, special computerized literature search.
4. Defense Technical Information Center, special computerized literature search.

Other Indexes

1. Applied Science and Technology Index
2. Government Reports Annual Index
3. Government Reports Announcements
4. Engineering Index Annual

General Sources

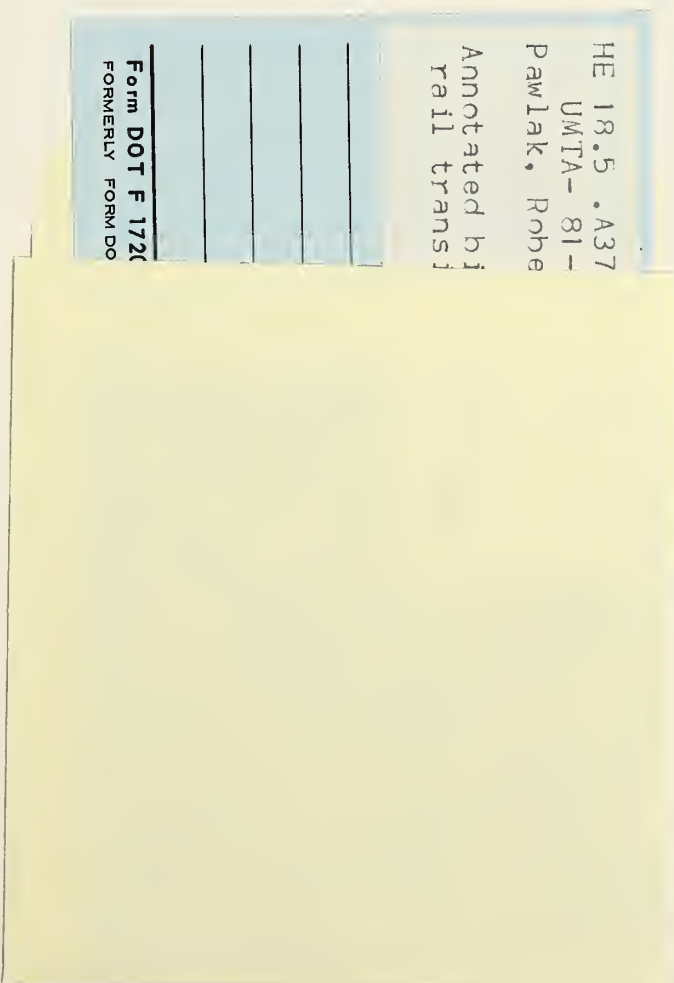
1. University of Southern California, Institute of Safety and Systems Management, Development of a Safety Program Plan for the Office of Safety and Product Qualification. Volume II -- Abstracts
2. BART and Metro - Rapid Transit for the San Francisco and Washington, D.C. Areas. A Bibliography with Abstracts. NTIS PS-77/0372. Period covered: 1964 - May 1977.
3. Innovation in Public Transportation, A Directory of Research, Development and Demonstration Projects. Published each fiscal year; describes projects currently funded by UMTA.
4. Transportation Safety Information Report Quarterly Highlights. Published at TSC.
5. Rail Transit Safety Annual Report. Sponsored by UMTA Office of Technology Development and Deployment, prepared by TSC. First published for 1978. (As of 1980, this report will be based on the data submitted to UMTA under its new safety reporting system.)

6. Urban Rail Supporting Technology: A Five-Year Progress Summary 1971-76.
7. Commonly available periodicals relating to the U.S. Transit industry.

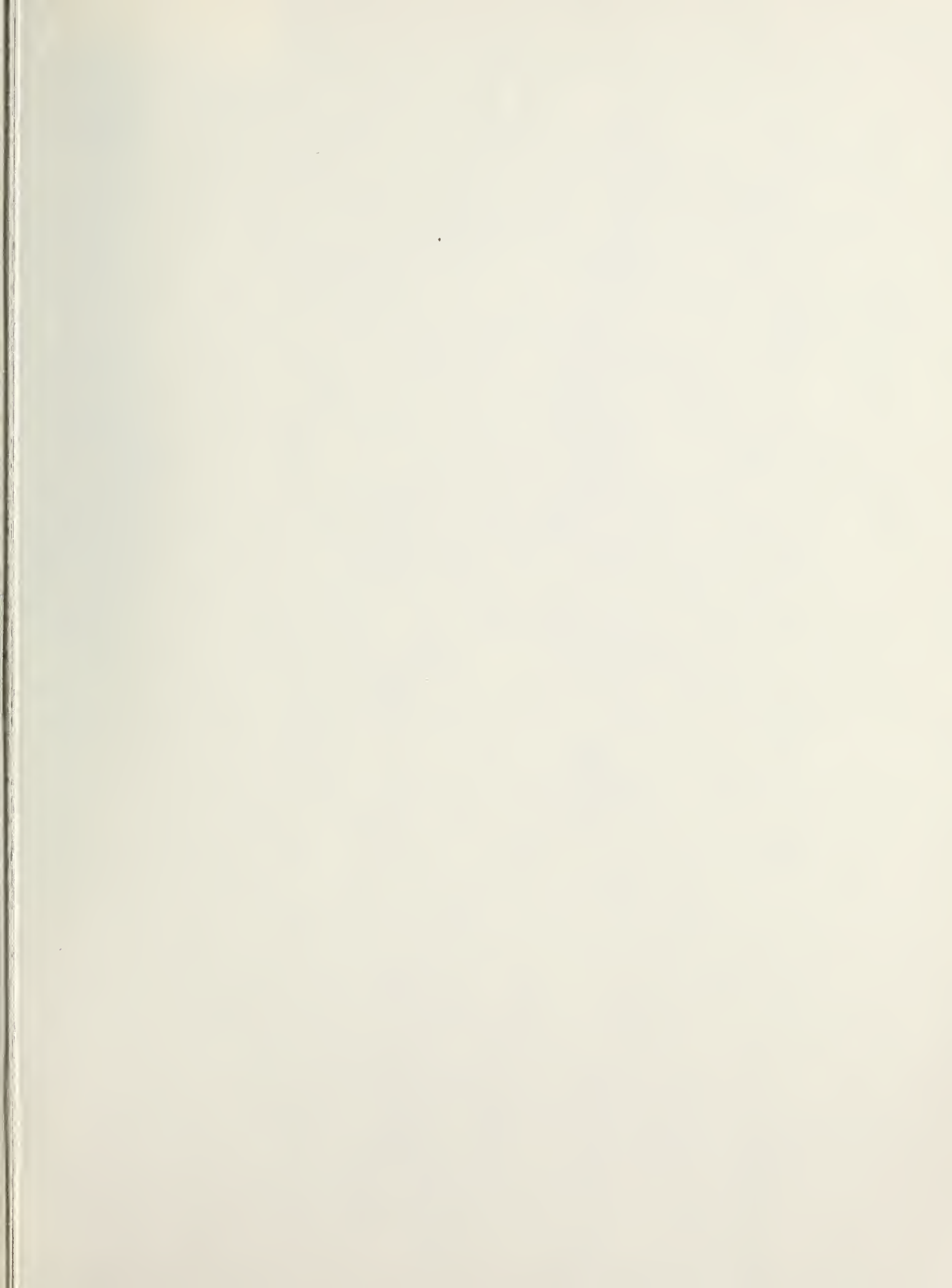
Foreign Sources

Collection of information for foreign source material is a more diffuse process. Many avenues were investigated, including:

1. I.R.T. and C.E.R.T.U.M. search.
2. RRIS computer search for foreign sources.
3. Telephone contact with specialized U.S. libraries. Visits to several libraries and transportation reading rooms in the Boston area. Visits to the DOT library and to the Washington reading room of the Organization for Economic Cooperation and Development (O.C.E.D.).
4. Direct inquiry of selected foreign manufacturing, transportation research, and transit organizations.
5. Approximately forty journals and magazines specializing in rail transportation during the period 1973 to 1979 were scanned for articles reporting urban rail safety R and D efforts by foreign organizations.









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