

T-M

TRANSPORTATION-  
MARKINGS

GENERAL TABLE OF  
CONTENTS

AND INDEX

With General Preface  
For T-M Monograph Series

Brian Clearman  
Mount Angel Abbey  
9th Edition, 2014

Transportation-Markings

General Table of Contents

With Index

TRANSPORTATION-  
MARKINGS

GENERAL TABLE OF  
CONTENTS

WITH INDEX

9th Edition

Brian Clearman

Mount Angel Abbey

Saint Benedict, Oregon

2014

Copyright (c) Mount Angel Abbey

1988, 1991, 1992,  
1993, 1994, 1997,  
1998, 2000, 2001,  
2002, 2003, 2004,  
2005, 2006, 2007,  
2008, 2010, 2011,  
2014,

TRANSPORTION-MARKINGS: A STUDY IN  
COMMUNICATION MONOGRAPH SERIES

Alternate Series Title: An Inter-modal Study of Safety Aids

Alternate T-M Titles: Transport [ation] Mark [ing]s/Trans-  
Marks/Transportation Control Devices/Waymarks

*T-M Foundations*, 6th edition, 2013 (Part A, Volume I,

First Studies in T-M) (2nd ed., 1991; 3rd ed. 1999; 4th ed  
2005; 5th ed, 2008)

*A First Study in T-M: The US*, 2nd ed, 1992 (Part B, Vol I)

port

*International Marine Aids to Navigation*, 3rd ed, 2010 (Parts C/D, Vol I), (2nd ed, 1988)  
[Unified 1st ed, Pts A-D, 1981, University Press of America]  
*International Traffic Control Devices*, 2nd ed, 2004 (Part E, Vol II, Further Studies in T-M) (1st ed, 1984).  
*International Railway Signals*, 1991 (Part F, Vol II)  
*International Aero Navigation*, 1994 (Part G, Vol II)  
*T-M General Classification*, 3rd ed, 2010 (Part H, Vol II) (1st ed, 1994; 2nd ed, 2003)  
*Transportation-Markings Database*:  
Marine, 2nd ed, 2007 (Part Ii, Vol III, Additional Studies in T-M) (1st ed, 1997)  
TCD, 2nd ed, 2008 (Part Iiii, Vol III) (1st ed, 2000)  
Railway, 2nd ed, 2009 (Part Iiii, Vol II) (1st ed, 2000)  
Aero, 2nd, 2009 (Part Iiv) (1st ed, 2001)  
Composite Categories Classification & Index, 2nd ed, 2012 (Part Iv, Vol III) (2nd ed, 2006)  
*Transportation-Markings: A Historical Survey, 1750-2000*, 2002 (Part J, Vol IV, Final Studies in T-M)  
*Transportation-Markings: An Integrative Systems Perspective: Communication, Information, Semiotics*, 2nd ed, 2014 (Part K, Vol IV) (1st ed, 2011).  
*T-M General Table of Contents with Index*, 9th ed, 2014 (1st ed-8th ed, 2002-2011)

# GENERAL PREFACE FOR

  

# TRANSPORTATION-

  

# MARKINGS

# MONOGRAPH SERIES

2014

## GENERAL PREFACE FOR TRANSPORTATION-MARKINGS MONOGRAPH SERIES

The T-M process outlined in these studies describes and classifies safety aids that assist operators of modes of transportation; that process also includes technical and historical perspectives. However, a simple describing and classifying of safety aids can obscure what is at the core of T-M: T-M is essentially a study of symbolic behavior (see Note No. 1). Symbols and what they mean permeate the seemingly practical subject matter of T-M.

T-M weaves in and out of many disciplines and perspectives. Among established disciplines that of semiotics (see Note No. 2A) may come closest to explaining the workings of T-M. Communication, design, culture (in particular, material culture), and holarchy also participate in that ex-

planation. Engineering and technology physically undergird T-M.

T-M studies extends over a quarter-century with early classification studies spanning nearly four decades. The order of the studies has been affected by specific topics and by chronology. A more logical and integrated outline of the studies would be variance with the historical development and listing of monographs. Such an outline can be suggested by a tripartite formulation:

Integrative Studies (General Table of Contents; Foundations; General Classification; T-M History; T-M: An Integrative Systems

6

Perspective: Communication, Information, Semiotics).  
Modal Studies (Marine Aids to Navigation; Traffic Control Devices; Railway Signals; Aero Nav aids; US T-M [an inter-modal and adjunct study]).  
Database (Marine; Road; Rail; Aero; Composite Classification/Index).

Introductory and integrative material for T-M can be found in a variety of places in the monographs. One such place is in the Prolegomena in Part A, *Foundations* (Addenda, Segments i and ii) which offers both a starting point and a summary of that material.

#### Note No. 1: T-M Defined

The original T-M definition referred to individual devices: “T-M is any device that aids a mode of transportation by giving information, providing regulations, or expressing warnings.”

In an essay for *Proceedings* (Chartered Institute of Transport, UK, June 1997) that earlier device-focussed definition was prefaced by this statement: “Transportation- Markings is an integrative and wholistic

study of all forms of safety aids in the realm of Transport.”

This General Preface offers a further correction by specifying the nature of that study: T-M is a study of symbolic behavior. The apparatus for producing symbols, the resulting symbols and their meaning are at the heart of that study.

7

The term Safety Aids can constitute an alternate term for T-M. Yet it is a very elastic term that can prove elusive as an internet search will quickly confirm. It remains an important term when placed in a transportation context and external to modes of transportation. Other possible alternate terms include Transport [ation] Marking [ing]s and Waymarks. An added source for information on terminology relating to T-M studies is to be found in the Appendix of *T-M Foundations* (Part A, 5th edition, 2008).

#### Note No. 2A Semiotics & T-M

P. Guiraud, S. Hervey, C. Morris, T. Sebeok are important sources for semiotics in these studies. D. Sles, A. Berger, W. Leed-Hurwitz, W. Nöth are other influences. However, what may be the most significant source was unknown to T-M until relatively recent: *Signs, Symbols, and Ciphers* (ET 1998), by Georges Jean, a professor of semiology and linguistics at the University of Maine (France). Jean surveys signs and symbols of many forms in his book. His descriptive treatment includes both physical apparatus and messages. His form semiotics is reserved to an anthological survey of Sign Theory. His chapter on “Road Signs” (Signes de Pistes in French; see Note No. 2B) includes visual, sound and electronic devices across the range of transportation modes. Quite possibly no other semiotic source comes close to his coverage. And the T-M studies bear more resemblance to Jean than any other source. Jean’s book is within the subject heading of Signs and Symbols but it is classified as Semiotics. There are seemingly few mentions of Jean in semiotic literature. Nonetheless, his work can be viewed as semiology

8

(or semiotics). And it provides a valid approach to that subject and it is an approach that can encompass T-M.



## Note No. 2B Road Signs/Signes de Pistes

Road Signs may be a literal translation of Signes de Pistes but it is inadequate for the full range of subject matter of Chapter 5. G. Jeans may possibly have sought a term that could encompass all forms of safety aids for transportation.

His choice, Signes de Pistes, is admittedly a problem in translation. Internet searches often result in a translation of “Sign of Track” which is employed in diverse ways. That translation may not be fully adequate yet it provides a clue. A further clue to its meaning is found in the “KudoZ network” (within the ProZ.com website devoted to translation assistance). One contributor states that Signes de piste “is derived from a mark on the ground or on a tree when scouts play a big outdoor game in a forest or natural area. In English we would say something like trail blazing signs or trail signs. A ‘signe de piste’ is an indication meaning ‘go’ or ‘stop’ or ‘left’ or ‘right’ or ‘look for a hidden message’ etc.”

Speculation suggests that Jean wanted an encompassing term and signes de pistes with its meaning of tracks, trails and messages of directions was his choice for that term. Perhaps it is less than fully adequate (or more likely, a new and expanded use of the term may not immediately achieve a fully understood significance) yet it has more value than a specific term such as road sign. Signe de piste in the French language may have a role similar to that of Transportation-Markings in the English language. Both terms struggle to encompass a broad range of activity lacking an established term.

10

**TRANSPORTATION-MARKINGS GENERAL  
TABLE OF CONTENTS**

*TRANSPORTATION-MARKINGS FOUNDATIONS*

PROLEGOMENA

Prolegomena: The Original Revisited  
a) T-M Studies

11

b) T-M: A Discipline?	18
c) T-M: Why Not a Discipline Now	20
d) T-M: Approaches & Forms	23
e) Underpinings for T-M	24

Prolegomena II: Addenda

i T-M in <i>Proceedings</i>	26
ii Building Construction: An Analogy for T-M Studies	32
iii Practical Symbol Practitioners	35
iv Final Edition	38
v The Semiotics Circus Tent	40

CHAPTER ONE  
THE STUDY OF T-M IN A MULTIFACTED  
FRAMEWORK: SEMIOTICS, COMMUNICATIONS,  
CLASSIFICATION & HOLONOMY

A Semiotics

1 Introduction to Chapter 1	43
2 Basic Semiotic Concepts	45

11

12

3 Semiotic Context	49
4 Semantics of the Object	50
5 Messages	53
6 Communication	58
7 Semiotics: Then & Now	60

B Taxonomy & Holon/Holarchy/Holonomy/  
Holonarchy: Expressions of Singular, Parts,  
Wholes & Transportation-Markings

1 Introduction	63
2 Nomenclature	65
3 Holon/Holonomy/Holarchy/Holonarchy	69
Notes on Sources	72

CHAPTER TWO

## LIGHT & COLOR PROCESSES & VISUAL T-M

### A Primer on Light & Color

1 Light	
a) Introduction to Chapter 2	77
b) Rudiments of Lights	78
2 Introduction to Color	82
3 Light Sources	87
B Color & T-M	
1 Historical Development of Color Use in T-M	90
2 Summary of Color Usage in T-M	94
C Historical Development of Color Messages in the 19th and 20th Centuries	
1 The Development of Messages, 1800-1920	
a) Prelude to Chapter 2C	99
b) Safety Aids, 1800-1870	100

13

c) 1870-1920	107
2 The Further Development of Messages 1920-2000	113

## CHAPTER THREE ELECTROMAGNETIC PROCESSES & ELECTRONIC T-M

A Primer on Electromagnetic Processes	
1 Electromagnetic Radiation & Waves	123
2 Electromagnetic Waves: Generation, Propagation, Reception	125
B Electronic T-M Forms: Signal Configurations & Receivers	
1 Introduction	129
2 Electronic Signal Configuration & Receivers: Multi-Station at Multiple Locations with Single Message	130
3 Electronic Signal Configuration & Receivers: Multi-Stations at one Location with Multiple- Messages	136

4 Electronic Signal Configurations & Receivers: Single Station - Single & Multiple Messages	138
------------------------------------------------------------------------------------------------	-----

CHAPTER FOUR  
ACOUSTICAL PROCESSES & ACOUSTICAL  
SAFETY AIDS

14

A Primer on Acoustical Processes	
1 Introduction & Terminology	143
2 Acoustical Processes	145
B Acoustical Signal Processes & Messages	
1 Types of Vibrating Instruments, Generating Sources, Messages & Impediments: Marine,	148
2 Types of Vibrating Instruments, Generating Sources, & Messages: Road, Rail & Aero	155
Note on Terminology	159

CHAPTER FIVE  
TRANSPORTATION-MARKINGS & DESIGN

A Design, Culture & T-M	
1 Introduction	161
2 Primer on Design	162
a) Terminology	163
b) Elements & Principle of Design	168
c) T-M, Design & Culture	170
3 Capsule History of Design: Victorian Era to the Present	
a) Introduction and the Victorian Era	173
b) Late 19th Century & Earlier Twentieth Century	176
c) Design Since World War II	
1) Introduction	178
2) Minimalism & Functionalism	180
3) Cultural Icons	181

B External Factors Affecting T-M Design	
1 Introduction for 5B & 5C	187

15

2 The Historical Process	188
3 Science & Technology's Impact on T-M Materials & Design	191

### C T-M & Design

1 Interaction of T-M & Infrastructures with Design	
a) The Impact of Transportation Routeway on the Design of T-M Forms	195
b) Influence on T-Ms International Requirements on Design	197
c) Summary of Factors Affecting the Creating of T-M Characteristics & Design	200
2 T-M as a Reflection of Culture	
a) Historical Backdrop	202
b) T-M: A Reflection of its Times	205
3 Message Systems & Design: T-M as Communications	
a) Introduction & Terminology	210
b) Graphic, Geometric & Alphanumeric Symbols Design	212
c) Visual, Acoustical & Electronic Message Configurations	213

### APPENDIX: TERMINOLOGY FOUNDATIONS OF TRANSPORTATION-MARKINGS

i) Core Terms and Meanings	
1) Introduction	
a) Prefatory Statement	217
b) Uses of T-M and Perspective on Transportation	218
2) Sources Employing Mark, Marker, Marking	
a) Mark/Marker/Marking	220

16

b) Variant Forms	222
c) LCSH	224

3) Other Terms	
a) Beacon, Signal, Sign: Other Primary Terms	224
b) Terms That Compete with T-M	225
c) Overarching Terms Employed, 1969-1975	228
ii The Use of Mark/Marker/Marking in T-M	
a) Marine Aids to Navigation	229
b) Aeronautical Navigation Aids	234
c) Railroad Signals & Other Devices	252
d) Traffic Control Devices	254
iii) Statistical Summary of Use of Mark/Marker/ Marking in T-M Monograph Series	264

BIBLIOGRAPHY	267
--------------	-----

## INDEXES

General	291
Names	
i Individual	299
ii Group, Political & Geographic Names	249

## *A FIRST STUDY IN T-M: THE UNITED STATES*

PREFACE	v
ACKNOWLEDGEMENTS	vi

## CHAPTER ONE [Formerly Chapter 7] US TRANSPORTATION-MARKINGS: PRELIMINARY CONSIDERATIONS

A Taxonomy & Semiotics	
1 Introduction: US Transportation-Markings: Model for Further Studies: The Role Classification	1
2 Communication, Semiotics & the Physical Object	3
B A Celebration of Classifications	
1 Forms of Classification in this Study	7
2 Messages & Phenomena	11
3 Nomenclature	17

CHAPTER TWO [Former Chapter 8]  
CLASSIFICATION

A Main Classification	
1 Outline Form: Markings Within a Context of Transportation-Markings	23
2 Explanatory Notes	32
B Variant Classification	
1 Schematic Classification	39

17

18

2 Pictorial Classification	44
3 Explanatory Notes for Schematic & Pictorial Classification	51

CHAPTER THREE [Formerly Chapter 9]  
DESCRIPTIVE TREATMENT OF US  
TRANSPORTATION-MARKINGS:  
SEA & AIR MODES

A Marine Aids to Navigation	
1 Introduction & Fixed Aids	55
2 Floating Aids	63
B Aeronautical Navigation Aids	
1 Introduction	67
2 Lighted Navigation Aids	68



3 Signs & Pavement Markings & Elevated Markings	76
4 Electronic Navigation Aids	80

CHAPTER FOUR [Formerly Chapter 10]  
DESCRIPTIVE TREATMENT OF US  
TRANSPORTATION-MARKINGS:  
SURFACE MODES

A Traffic Control Devices	
1 Introduction & Traffic Control Signals	85
2 Signs, Markings & Related Devices	90
B Railway Signals, Signs & Indicators	

19

1 Introduction & Lighted/Partially-Lighted Signals	98
2 Signs & Unlighted Signals	105

APPENDIX  
CLASSIFICATION EXPANSION  
& EXPLANATIONS

i	a) Multiple & Variant Classification	107
	b) Explanatory Notes	119
ii	Double Transition Classification	
	a) Markings Within Forms of Energy	127
	b) Markings Within Marking Forms	134
	c) Explanatory Notes	140
	d) Special Note	146
iii	Classification of Messages: Signs & Markings	
	a) Road	149
	b) Aero, Railway & Marine	165
	c) Explanatory Notes	173

BIBLIOGRAPHY	177
--------------	-----

## INDEXES

General Index	185
Index of Marking Phenomena	187

### *INTERNATIONAL MARINE AIDS TO NAVIGATION*

PREFACE	12
ABBREVIATION	13

## CHAPTER ONE INTRODUCTION TO INTERNATIONAL MARINE AIDS TO NAVIGATION

A Introduction and Overview	
1 Introduction	15
2 Overview	17
3 Classification & Semiotics	20
B Methodology	
1 Introduction	21
2 The Problem of Methodology for Fixed Visual Markings	24

## CHAPTER TWO HISTORICAL SURVEY OF BUOYS & BUOYAGE SYSTEMS

A Development of the Buoys & the Impact of Technology	
1 The Impact of the Industrial Revolution on Buoys	28
2 The Buoy & Its Development in the 19th Century	30

21

B The Development of International Buoy Systems	
1 International Buoyage Systems, 1846-1936	33
2 Red/Green to Port--Red/Green to Starboard: A Special Problem in International Buoyage	36
3 IALA Buoyage Systems	39

CHAPTER THREE  
CLASSIFICATION & DESCRIPTION OF BUOYS  
IN INTERNATIONAL USAGE

A Classification	
1 Introduction	47
2 The Classification	47
3 Explanatory Notes	50
B Description of Buoy Types	
1 Lighted & Lighted-Sound Buoys	56
2 Unlighted Buoys: Conical and Can/ Cylindrical Buoys	57
3 Unlighted Buoys: Spar, Standard & Miscellaneous	62
4 Sound Buoys	68

CHAPTER FOUR  
MESSAGE SYSTEMS FOR FLOATING AIDS  
TO NAVIGATION

22

A Introduction & USB	
1 Introduction	79
2 Full USB Systems	80

3 USB User With Limited Changes	85
4 Special USB-Compliant Systems	87
5 Partial USB Systems	89
B International Marine Conference-Influenced Buoyage System	96
C IALA Buoyage System	102

## CHAPTER FIVE FIXED LIGHT MARKINGS

A Introduction, Criteria for Major & Minor Forms & History	
1 Introduction	110
2 Criteria for Major & Minor Forms	110
3 History	
a) Introduction & Early History	114
b) 1750-1870	115
c) 1870-2000: Lighthouse Zenith & Decline	118
B Classification of Fixed Marine Lights With Explanatory Notes	
1 The Classification	121
2 Explanatory Notes	
a) Overview	123
b) Detailed Observations	124
C Descriptive Treatment of Structures Types	130

23

D Message Systems for Lighted Aids	
1 Light Phase Characteristics	136
2 Special Lights Messages, Major Lights Day Messages & Minor Lights Messages	142

## CHAPTER SIX DAYBEACONS

A Introduction, Terms, & History	
----------------------------------	--

1 Introduction & Terms	150
2 History	153
B Classification & Descriptions of Type of Daybeacons	
1 Introduction, Classification & Explanatory Notes	
a) Introduction & Classification	156
b) Explanatory Notes	157
2 Descriptions of Types of Daybeacons	159
C Message Systems	
1 Introduction & Systems	162
2 National Daybeacon Agencies	165

## CHAPTER SEVEN RADIO AIDS TO NAVIGATION

A Introduction, History & Classification	
1 Introduction	175
2 History	177

24

3 Classification with Explanatory Notes	175
a) The Classification	182
b) Explanatory Notes	183
B Satellite-Based Navigation & Hyperbolic Aids	
1 Satellite-Based Navigation	185
2 Hyperbolic Aids	186
C Radio, Radar & Miscellaneous Systems	191

## CHAPTER EIGHT FOG SIGNALS

A Introduction & Classification	
1 Introduction	
a) Revisited: Fog Signals & T-M Studies	198
b) Introduction	200

2 Classification of Fog Signals with Note	
a) The Classification	202
b) Explanatory Notes	204
B History, Types, and Messages	
1 History & Types	205
2 Messages	209

APPENDIX I: SELECTED TOPMARKS PATTERNS	211
-------------------------------------------	-----

APPENDIX II: A UNIFIED CLASSIFICATION OF MARINE AIDS TO NAVIGATION	215
--------------------------------------------------------------------------	-----

25

BIBLIOGRAPHY	
Government Publications	227
Books, Periodicals & Miscellaney	233

INDEXES	
i General Index	241
ii Names	244
iii T-M Forms	250

TABLE OF ILLUSTRATIONS	
Buoys	70
Cardinal Systems	82
Light Phase Characteristics	148
Daybeacons	171
Topmarks	211

*INTERNATIONAL TRAFFIC CONTROL DEVICES*

PREFACE	10
CHAPTER ONE	
THE DEVELOPMENT OF TRAFFIC CONTROL DEVICES, 1903-1950	
A European Traffic Signs	
1 Introduction	15
2 European Traffic Signs, 1909-1926-1931	17
3 The Old British System (OBS), 1903-1950	23
B Final League of Nations/Initial United Nations Traffic Signs System	
1 Introduction and League of Nations, 1938-1939	26
2 United Nations Protocol, 1949	35
C Traffic Signs Developments in Africa/Middle East/Asia/Pacific/Americas, 1925-1950	
1 Early Africa/Middle East/Asia/Pacific/Americas	
a) The Americas	40
b) Africa/Middle East/Asia/Pacific	40
2 More Recent Africa: CASATC	46
D Traffic Signals & Traffic Markings to 1950	
1 Introduction	53
2 Traffic Signals	53
3 Traffic Markings	56

CHAPTER TWO  
CLASSIFICATION WITH EXPLANTORY NOTES

A The Classification Revisited	
1 Introduction to Chapter	59
2 The Revisiting of the Classification	
a) The 4th Digit Problems: Aid Affected by it /Aids not Affected by it	60
b) Classifying Principle: 4th-Digit May Represent Categories not Separate Aids	62
3 Changes in Classification Message	64
B Classification & Notes	
1 The Main Classification	66
2 Explanatory Notes	68
General Note	74
3 Variant Classification for TCDs	75
General Note	79

CHAPTER THREE  
TRAFFIC SIGNALS WITH INTRODUCTION  
TO ENTITIES SPONSORING SIGNALS

A Introduction	
1 Introduction to Chapter	80
2 The UN Draft Convention, 1952	81
3 The IAMM of TCDs	82
4 Code for TCD, ECAFE	85
5 Outgrowths of the 1952 Draft Convention	86

6 Changes & Reformation of Older Systems, 1950-1967	
a) Introduction & United Kingdom	87



b) Scandinavia	89
c) Canadian TCDs	89
d) The United States	90
e) The Threshold of 1968: Divergence & Unity	91
B Traffic Signals	
1 Introduction & Traffic Signals Before 1968	
a) Introduction	93
b) 1968 UN Conference: Traffic Signal Message	
c) Changes After 1968: Europe and North America	100

## CHAPTER FOUR WARNING & INFORMATIVE SIGNS

A Warning Signs, 1952-1968	
1 Introduction	103
2 1952-1967	104
3 UN 1968 Danger Warning Signs	106
4 Regional & National Changes & Implementation	111
B Informative Signs	
1 Introduction	114
2 Informative Signs, 1952-1967	114
3 UN 1968 & Informative Signs	
a) Changes in Drafts	116
b) Signs in UN 1968	118

29

c) Aftermath of UN 1968: Implementation & Changes	122
---------------------------------------------------	-----

## CHAPTER FIVE REGULATORY SIGNS

A Regulatory Signs Before 1968	
1 Introduction	126
2 Regulatory Signs, 1952-1967	127

B UN 1968 & Aftermath	
1 The Building of the UN System	131
2 The Problem of the Red Oblique Bar	135
3 Regulatory Signs at UN 1968	143
4 Aftermath of UN 1968: Regulatory Signs	147

## CHAPTER SIX TRAFFIC MARKINGS

A Introduction & Traffic Markings Before 1968	
1 Introduction: Terms, Classification, Overview	153
2 Traffic Markings, 1952-1967	155
B UN 1968 & Aftermath	
1 The Building of the UN Systems	158
2 UN 1968 Provisions	159
3 Aftermath of UN 1968	162

30

## APPENDIX I GLOSSARY OF TERMS

i Classification System Terms	168
ii Message Characteristics Terms	170
iii Marking Types Terms	172
iv Transportation Terms	174
v Political Terms	175

## APPENDIX II A COMPARATIVE REVIEW OF INTERNATIONAL ROAD SIGNS, 1909-1968

i Introduction	177
ii The Chart	182
iii Explanatory Notes	199

iv	Sign Shapes & Color Formats	199
	a) Sign Shape Illustrations	200
	b) Sign Shapes	208
	c) Systems Use of Color	210

## BIBLIOGRAPHY

i	Abbreviations for Sources	217
ii	Books, Journals & Reports (Non-Governmental Sources)	219
iii	UN Sources	
	a) UN Conferences on Road Traffic	221
	b) Other UN Sources	222
	31	
iv	Other Government Sources	223

## INDEXES

	General Index	227
	Indexes of Names	231
	Index of T-M Phenomena	237

*INTERNATIONAL RAILWAY SIGNALS*

PREFACE	ix
ACKNOWLEDGEMENTS	xi
ABBREVIATIONS	vii

CHAPTER ONE [Formerly Chapter 28]  
RAILWAY SIGNALLING; INTRODUCTION,  
HISTORY & METHODOLOGY

A Introduction, Physical Properties & Semiotics of the Signal	
1 Introduction	1
2 Physical Properties	2
3 Semiotics of the Signal	6
B Aspects of the History of the Railway Signal	
1 The Formative Period, 1830-1920	13
2 Further Developments, 1920-1980	20
C Methodology of the Monograph	25

CHAPTER TWO [Formerly Chapter 29]  
CLASSIFICATION

A The Main Classification	
1 Introduction	33
2 Classification of Signals	35
3 Explanatory Notes	38

B Variant Classification	
1 Introduction	47
2 Shape Configuration of Signals	49
3 Illustrations	66
4 Explanatory Notes	78

CHAPTER THREE [Formerly Chapter 30]  
COLOR & MEANINGS

A Toward Basic Principles in Signalling	
1 Meaning of Colors	93
2 IUR Principles	96
3 The URO System	98
4 British Signal Practice	99
5 North American Signal Practice	100
6 European Signal Practices	103
7 UAR Signal System	105
B Color Usage in Signals, Signs, Markings	
1 Basic Colors	109
2 Signal Colors: Combination	112
3 Less-Used Colors	116
4 Color Usage in Combination with Non-Color Symbols	118

CHAPTER FOUR [Formerly Chapter 31]  
ALL-LIGHTED SIGNALS & MESSAGES

A Types of Signals

1 Color-Light Signals: Forms & Configurations	123
2 Semaphoric Signals in All-lighted Forms: Position & Color-Position	128
3 Cab Signals: Introduction & Types	131
4 Graphic, Geometric & Alphanumeric Types	132
<b>B Message for All-Lighted Signals</b>	
1 Introduction & Basic Messages	135
2 Complex Message Configuration	138
3 Messages for Position-Light & Color-Position Signals	142
4 Messages for Cab-Signals	146
5 Messages for Graphics, Geometric & Alphanumeric Signals	149

**CHAPTER FIVE [Formerly Chapter 32]  
PARTIALLY-LIGHTED & UNLIGHTED  
SIGNALS, SIGNS, MARKINGS & MESSAGES**

<b>A Semaphore Signals: Introduction</b>	
1 Background, Terminology & Characteristics	151
2 Models of the Semaphore: National, Regional, & Technical	154

35

<b>B Messages for Semaphore Signals</b>	
1 Fully-Integrated Semaphore Signals	159
2 Partially & Non-Integrated Semaphore Models	162
<b>C Signal Boards</b>	
1 Terminology, Types & Locations	165
2 Messages	168
<b>D Graphic &amp; Geometric Signals</b>	
1 Terminology, Types of Signals & Functions	175
2 Geometric Signals	177
3 Graphic Signals	180

E	Messages for Geometric & Graphic Signals	
1	Graphic Signals: Rotating & Revolving Discs & Panels	184
2	Free-Standing Geometric Signals & Messages	186
F	Non-Sign Markings	
1	Problems of Terminology for Markings & Signs	192
2	Types & Messages for Non-Sign Markings	194
G	Railway Signs	
1	Introduction & Types	198
2	Messages for Signs	203
	 GLOSSARY OF TERMS	 207

36

#### APPENDICES:

I	Staff, Tablets, Tickets & Tokens	214
II	Major Railway Systems: Signal Types & Messages	221

#### BIBLIOGRAPHIES:

I	Signs, Signals & Marking Sources	237
II	Other Materials	245

#### INDICES:

	General	259
	Sign, Signal, & Marking	264
	Names of Persons & Organization	270

*INTERNATIONAL AERO NAVIGATION AIDS*

PREFACE	vii
ACKNOWLEDGEMENTS	viii
ABBREVIATIONS	x

CHAPTER ONE [Formerly Chapter 33]  
AERONAUTICAL NAVIGATION AIDS:  
INTRODUCTION & EARLY  
DEVELOPMENTS

A Introduction	
1 Terminology, The Nature of Aero TMs & Methodological Concerns	1
2 Aero Nav Aids: Physical Properties & Semiotics	9
B History of Aero Nav Aids	
1 Introduction & Early Aviation Developments	16
2 Early History of Aero Aids, 1919-1937	20
3 Development of Aero Aids, 1938-1943	32
4 Final Developments Before ICAO, 1944-1950	37



CHAPTER TWO [Formerly Chapter 34]  
THE CLASSIFICATION

A Main Classification

37

38

1 Introduction	49
2 Main Classification	51
3 Explanatory Notes	54
B Variant Classification	
1 Illustrations	72
2 Explanatory Notes	78

CHAPTER THREE [Formerly Chapter 35]  
LIGHTED AERO NAVIGATION AIDS

A Approach Lighting	
1 Introduction	85
2 Equipment	87
3 Messages	89
B Final Approach Lighting	
1 Introduction	92
2 Messages	93
3 Equipment	99
C Runway & Taxiway Lighting	
1 Background, Terminology & Function	101
2 Inset Lights	102
3 Elevated Lights	105
4 Messages for Inset & Elevated Lights	107
D Beacons & Obstructing Lighting	
1 Introduction	112
2 Beacons	113

3 Obstruction Lights	115
4 Messages for Beacons & Obstruction Lights	118

CHAPTER FOUR [Formerly Chapter 36]  
PARTIALLY-LIGHTED & UNLIGHTED AERO  
NAVIGATION AIDS

A Signs & Markings	
1 Introduction to Chapter 4	121
2 Signs: Types & Messages	123
3 Markings: Type & Messages	124
B Indicators, Markers, Obstruction Markings & Restricted Use Markings	
1 Indicators: Types & Messages	129
2 Markers: Types & Markers	130
3 Obstruction Markings: Types & Messages	134
4 Restricted Use Area Visual Aids	136

CHAPTER FIVE [Formerly Chapter 37]  
AERO ELECTRONIC NAVIGATION AIDS

A Fully Integrated Systems	
1 Chapter 5: Overview & Changes	139
2 Instrument Landing Systems (ILS)	142
3 Microwave Landing Systems (MLS)	145
B Independent & Partially Integrated Aids	
1 VOR, TACAN, VORTAC & DME	148
2 Beacons & Multi-mode Radio Aids	151

APPENDIX: COMPARATIVE REVIEW OF ICAO AERO NAV AIDS, 1949-1991	159
------------------------------------------------------------------	-----

BIBLIOGRAPHY	169
--------------	-----

INDICES		
i	General Index	191
ii	Index of Types of Aids & Systems	192
iii	Index of Names: Personal, Corporate & Organizational	193

*TRANSPORTATION-MARKINGS GENERAL  
CLASSIFICATION*

PREACE WITH REFERENCES FOR QUOTES	7
-----------------------------------	---

CHAPTER 1  
WITHIN TRANSPORTATION MODE: CONTEXT  
(MARINE, AERO, ROAD, RAIL)

A Water & Air Transportation-Markings		
1	Marine Aids to Navigation with Floating & Fixed Aids Submodes with Notes	17
2	Aero Navigation Aids & Note	20

B Surface Transportation-Markings		
1 Traffic Control Devices & Note	23	
2 Railway Signals, Signs, Markers & Notes		25

CHAPTER 2  
INTERNATIONAL CLASSIFICATION BASED  
ON MESSAGE ENERGY FORMS

A Main Classification		
1 Visual Forms--All-Lighted Forms	30	
2 Visual Forms--Partially-Lighted Forms	31	
3 Visual Forms--Unlighted Forms	33	
4 Acoustic Forms	35	
5 Electronic Forms	36	
6 Note	38	
B Alternate Classification	45	
1 Schematic Classification		46
	41	
	42	
2 Alternate Classification: International Classification Within Matrix of Nature of Messages		50

CHAPTER 3  
VARIANT CLASSIFICATIONS

A Aids for Water & Air Transportation		
1 Marine Aids to Navigation Forms	56	
2 Aero Navigation Aids Forms	58	
B Aids for Surface Transportation		
1 Traffic Control Devices	65	
2 Railway Signals, Signs, Markers	67	
C Variant Taxonomy in a Different Key: Transportation-Markings in One Nations: The U.S.		76
Note		80

## APPENDICES

### I NOMENCLATURE

i	Main Classification	
	a) Background	87
	b) Nomenclature	89
ii	Variant Classification	92
iii	Adjunct Classification	95

43

### II INDEX OF CLASSIFICATION & NOMENCLATURE MATERIALS

a)	Main Classification	97
b)	Adjunct Classification	99
c)	Nomenclature & General Classification	
	Methods	100

### III TRANSPORTATION-MARKINGS PSALMS

I-VI	Marine	102
VII-IX	Aero	107
X-XII	Rail	112
XIII-XVII	Road	114

### INDEXES

General	120
Names	121
Transportation-Marking Forms	124

*TRANSPORTATION-MARKINGS DATABASE: MARINE*

PREFACE	11
ACKNOWLEDGMENTS	13

CHAPTER ONE  
FLOATING AIDS

A Indexes	
1 Categories	15
2 Alphabetical	28
B Buoy Physical Forms	
1 Overarching Terms	
a) Basic Overarching Terms	42
b) Other Overarching Terms	44
c) Overarching Terms: General Marine Aids to Navigation Terms	46
2 Lighted Buoys	49
3 Can & Cone Buoys	53
4 Spar Buoys	56
5 Barrel & Cask Buoys	57
6 Single Forms of a Unitary Nature: Past & Present	58
7 Sound Buoys	60
8 Combination Buoys	64
9 Other Physical Forms	
a) Materials of Construction Subforms	67
b) Special Names Referring to Physical Structure	67
c) Other Forms	68

44

C Buoy Morphological Forms	
1 Location	
a) Approach Buoys	71
b) Channel Edge Buoys	71
c) Channel Limits Buoys	72
2 Message Forms	74
3 Hazard Buoys	75
4 Indirect Navigation Buoy Forms	
a) Station Buoys	77
b) Towing Buoys	78
c) Anchor, Anchorage & Mooring Buoy	78
5 Special Purpose Buoys	80
6 Miscellaneous Buoys	80
D Buoy Adjunct Terms: Systems, Marks & Special Classification	
1 Systems	81
a) General Terms	82
b) Cardinal Systems & Lateral Systems	83
c) Other Systems: Red to Starboard Systems	84
d) Other Older Systems	85
e) League of Nations Forms	86
f) IALA System Forms	86
2 Marks	87
3 Special Classification	
a) Bodies of Water & Buoy Names	89
b) Classes of Buoy Names	89
E Major Floating Aid Forms	
1 Overarching Terms	91
2 Lightships & Light Vessels	91
a) General Comments	91
b) Lightships & Light Vessels	91
46	
c) Human-related Terms: Operation of Lightships & Light Vessels	93
3 Light Floats	94
4 Large Navigational Buoys	94

## CHAPTER TWO

## FIXED LIGHTS

A	Indexes	
1	Categories	97
2	Alphabetical	106
B	Overarching Terms	
1	General Overarching Terms	119
2	Overarching Terms for Major Lights	119
3	Overarching Terms for Minor Lights	128
C	Major Light Forms	
1	Subdivisions	130
2	Individual Entries	134
D	Minor Light Forms	
1	Single Members	
a)	Narrower Forms	140
b)	Wider Forms	143
2	Multiple-Members Forms	144
3	Other Forms: Enclosed/Composite/ Single Structures	146
E	Morphological Forms & Adjunct Terms	
1	Major Lights	149
2	Minor Lights	152
3	Character of Operation Terms	
a)	Forms of Operations	155
b)	Nature of Operations	157
		47
4	Miscellaneous Terms	157
F	The Physical Light in the Form of Light Energy	
	Emission Configurations: Light Phase	
	Characteristics	158
1	General Characteristics of Lights & Light Generating Apparatus	160
2	Special Characteristics of Lights	
a)	Fixed Light/Fixed	162
b)	Fixed & Flashing Lights/Fixed & Flashing	163
c)	Flashing/Flashing Lights	163
d)	Isophase	166
e)	Occulting/Occulting Lights	167
f)	Quick, Very Quick, and Ultra Quick	



Characteristics	
I. Quick Section	168
II. Very Quick Section	170
III. Ultra Quick Section	171
g) Alternating Lights	172

### CHAPTER THREE DAYBEACONS

A Indexes	
1 Categories	173
2 Alphabetical	178
B Overarching Terms & Special Topics	
1 Overarching Terms	
a) General Comments & Basic Terms	183
b) Overarching Terms: Shared & Foreign Language Terms	186
48	
2 Special Topics: Topmarks & Daymarks Forms	
a) General Comments	187
b) Topmarks	188
c) Daymarks	189
3 Special Topics: Morphological Forms	
a) Leading/Range Marks	191
b) Signals	192
c) Other Forms	192
C Physical Forms	
1 Unidirectional Forms	
a) Established Name Forms	194
b) Local Name Forms	197
2 Structural Daybeacon Forms	
a) General Comments	201
b) Structural Daybeacons Employing Parent Names	202
c) Structural Daybeacon with Established Names	203
d) Structural Daybeacons with Local/Descriptive Names	204

3 Natural Marks Forms	209
-----------------------	-----

## CHAPTER FOUR FOG SIGNALS

### A Indexes

1 Categories	212
2 Alphabetical	219

49

### B Fog Signal Types

1 Overarching Terms	228
2 Diaphone Fog Signals	235
3 Diaphragm Horns	
a) Overarching Terms	236
b) Diaphragm Signals - Compressed Air	237
c) Diaphragm Signals - Oscillator	239
4 Reeds	243
5 Sirens	245
6 Percussion Signals	
a) Bells	250
b) Gongs, Combination and Miscellaneous Forms	253
7 Whistles	254
8 Explosive Signals	257
9 Submarine Signals	261
10 Miscellaneous Signals	264

## CHAPTER FIVE RADIO AIDS

### A Indexes

1 Categories	265
2 Alphabetical	272

B Overarching Terms	281
---------------------	-----

### C The Radiobeacon

1	Overarching Terms	284
2	Radiobeacon Main Forms	
	a) Directional Forms	286
50		
	b) Non-directional Forms	287
	c) Rotating Forms	288
	d) Composite Forms	288
3	Other Forms of the Radiobeacons	288
4	Character of Operation Forms	290
D	Hyperbolic Forms	
1	Overarching Terms	291
2	Decca Aids	292
3	Loran Aids	294
4	Hyperbolic Forms: Single & Near-Single Forms	298
5	Partially Hyperbolic Forms	
	a) Consol	299
	b) Raydist Aids	300
E	Radar, Satellite & Other Forms	
1	Radar Reflectors	
	a) Overarching Terms & Corner Reflectors	302
	b) Radar Reflectors: Other Forms	303
2	Secondary & Primary Forms of Radar	
	a) Overarching Terms & Primary Forms	304
	b) Shoran	305
	c) Transponder Beacon	306
3	Satellite Navigation Forms	308
	a) Overarching & Other Forms	308
	b) GPS	309
	c) Naval Transit Satellite Navigation System	310
	d) Other Satellite Systems	311
4	Other Forms	
	a) Sound/Radio Forms	313
	b) Miscellaneous Forms	314

BIBLIOGRAPHY

Books, Letters & Periodicals	315
Government Publications	320
Trade Literature	324

*T-M DATABASE: TRAFFIC CONTROL DEVICES*

PREFACE	9
---------	---

CHAPTER ONE  
INFORMATIVE SIGNS

A Indexes	
1 Categories	11

2	Alphabetical	19
<b>B</b>	<b>Informative Signs</b>	
1	Introduction, Overarching Terms & Message Configurations	
a)	Overarching & Sub-Overarching Terms	27
b)	Message Configurations	31
2	Destination & Distance Signs	34
3	Route Markers	
a)	Introductory Note & Overarching Terms	39
b)	Specialized Route Marker Terms	40
c)	Route Markers Tabs	44
4	Mileposts	46
5	Signs Giving General Information (SGGI)	
a)	Overarching Terms	49
b)	Service Sign	52
c)	Parking Signs	55
d)	Recreation Signs	56
e)	Other Signs	59

## CHAPTER TWO WARNING SIGNS

<b>A</b>	<b>Indexes</b>	
1	Categories	67
2	Alphabetical	75
<b>B</b>	<b>Warning Signs</b>	
1	Introductory Note, Message Configurations & Overarching Terms	
a)	Introductory Note & Overarching Terms	85
b)	Message Configurations	88
2	Roadway Alignment Signs	
a)	Introductory Note & Overarching Terms	89
b)	Specific Terms	91
3	Roadway Condition Signs	

a) Introductory Statements & Overarching Terms	95
4 Intersection Signs	
a) Introductory Note, & Overarching Terms	102
b) Specific Terms	103
5 Intermittent Moving Hazards Signs	106
6 Construction & Maintenance Signs	114
7 Other Hazards Signs	
a) General or Alternate Danger Signs	117
b) Miscellaneous Forms	119
c) Supplemental Plates/Plaques	123

54

### CHAPTER THREE REGULATORY SIGNS

A Indexes	
1 Categories	126
2 Alphabetical	134

### CHAPTER THREE REGULATORY SIGNS

A Indexes	
1 Categories	126
2 Alphabetical	134
B Regulatory Signs	
1 Introduction, Overarching/Sub-Overarching Terms & Messages	
a) General Note	145
b) Overarching & Sub-Overarching Terms	145
2 Priority Signs	148
3 Prohibitory & Restrictive Signs	
a) Prohibitory & Restrictive of Entry Sign	

1) One-Way & Both Direction Forms	151
2) Exclusion Categories of Vehicle Forms	152
3) Vehicular Exclusion : Weight, Height & Length Forms	154
4) Miscellaneous & Single Forms	155
b) Prohibitory & Restrictive: Turns & U-Turn Sign	156

55

c) Prohibitory & Restrictive: Overtaking (Passing) Signs	157
d) Prohibitory & Restrictive: Speed Limit Signs	158
e) Miscellaneous, Single Forms, & End of Prohibition or Restrictive Signs	160
4 Mandatory Signs	163
5 Standing & Parking Signs	172
6 Pedestrian Crossing Signs	178
7 Miscellaneous Regulatory Signs	181

## CHAPTER FOUR TRAFFIC SIGNALS

A Indexes	
1 Categories	183
2 Alphabetical	187
B Traffic Signals	
1 Traffic Control Signals	
a) Overarching Terms & General Note for Traffic Signals	191
b) Specific Entries	195
c) Messages	
d) Traffic Signals Operations	199
2 Pedestrian Signals	200
3 Traffic Signals-Other Forms	202
4 Flashing Beacons	
a) Overarching Terms	206

b) Specific Terms	207
-------------------	-----

56

5 Lighting Devices	209
6 Grade/Level Crossing Signals	211

## CHAPTER FIVE TRAFFIC MARKINGS

A Indexes	
1 Categories	214
2 Alphabetical	221
B Traffic Markings	
1 Overarching & Sub-Overarching Terms with General Notes	
a) Overarching Terms with General Notes	229
b) Sub-Overarching Terms	
1) Broader Terms	233
2) More Restricted Forms	235
2 Pavement & Curb Markings	
a) Longitudinal Markings	236
1) Center Line Markings	236
2) Edge Lines Markings	236
3) Lane Markings	238
4) Other Longitudinal Markings	240
b) Transverse Markings	243
c) Other Pavement & Curb Markings	245
d) Physical Pavement Marking Forms	249
1) Raised Pavement Markers	249
2) Traffic Marking Physical Terms- Morphological/Physical	253
3) Other Horizontal Markings	254

57

3 Hazard & Delineation Markings	
a) Hazard/Obstruction Markings	256



b) Delineators	259
c) Barricades & Channelizing Devices	260

#### APPENDIX I: COMPARATIVE SURVEY OF SIGNS

i Introduction	263
ii Traffic Signs Systems	263
iii Traffic Signs Approaches	265
iv Traffic Sign Categories	267
v The Chart	267
vi Overarching Terms for Traffic Signs	279

#### APPENDIX II: TERMS FOR TRAFFIC CONTROL DEVICES

BIBLIOGRAPHY	285
--------------	-----

#### *TRANSPORTATION-MARKINGS DATABASE: RAILWAY SIGNALS, SIGNS, MARKS, MARKERS*

PREFACE	12
ABBREVIATIONS	15

#### CHAPTER ONE GENERAL RAILWAY SIGNAL TERMS

A	Indexes	
1	Categories	17
2	Alphabetical	41
B	General Railway Signal Terms	
1	Overarching Terms	
a)	Signal Terms	63
b)	Fixed/Lineside/Railway-Railroad/ Wayside Signal Terms	65
c)	Other Overarching Terms	69
2	Possibly/Partial Overarching Terms	69
a)	Energy & Technology-Related Terms	72
b)	Physical-Morphological Overlapping Terms	75
c)	Possible Overarching Terms- Miscellaneous	76
3	Primary Overarching Terms in Other Languages	78
4	Signal Components	82
5	Signal Confirmation	86

58

59

C	Messages: Aspects & Indicators	
1	Basic Terms & Colors	
a)	Terms	88
b)	Colors	
1)	Basic Colors	89
2)	Color Combinations	90
3)	Specialized Colors	91
4)	Spatial Configurations	92
5)	Variant Color Combinations & Miscellaneous Color Uses	93
2	Aspects	
a)	Single-Aspect Terms	94
b)	Two-Aspect Terms	94
c)	Three-Aspect Terms	96
d)	Four-Aspect Terms	97
e)	Five-Aspect Terms	98

f) Other Aspects	98
3 Indications	
a) Primary Forms	99
b) Specialized Forms	101
D Morphological Terms	
General Note	105
1 Running Signal Terms	
a) Overarching Signal Terms	106
b) Core Terms: Stop, Distant & Related Signal Terms	
1) Stop Signal Terms	108
2) Starting Signal Terms	108
3) Distant Signal Terms	110
c) System Terms	113
d) Route & Junction Signals/Indicator Terms	
60	
1) Basic Terms	116
2) Other Route & Junction Terms	117
e) Other Signal Terms Pertaining to Running Operations	119
2 Subsidiary Signal Terms	
a) Overarching Terms	123
b) Switch Indicator/Signals & Points Indicator/Signals	124
c) Shunt Signal/Indicator Terms	
1) Overarching Shunting Terms	126
2) Physical Shunting Terms	127
3) Function-Related Shunting Signal Terms	128
d) Siding, Train Yards & Other Signals	131
3 Message-Related Signal Terms	131
4 Miscellaneous Signal Terms	133
E Systems (or Methods of Control)	
1 Block Systems Terms	
a) Block System Overarching Terms	136
b) Manual Block Signal Systems	139
c) Controlled Manual Block Systems	139
d) Automatic Block Systems	141
e) Absolute/Permissive Systems	145

f) Other Block Terms	149
2 Interlocking Terms	149
3 Train Control Terms	
a) Overarching Terms	154
b) Forms of Train Control	158
c) Subdivisions of Train Control	
1) Train Stop	159
2) Speed Control	161
61	
3) Traffic Control	162
4) CTC	
d) Specific Named Systems	163
e) Miscellaneous Terms	169

## CHAPTER TWO

### ALL-LIGHTED SIGNALS

A Indexes	
1 Categories Index	172
2 Alphabetical Index	180
B Overarching, Color Light, & Other	
All-Lighted Signals	
1 Overarching Terms	190
2 Color Light Signal Terms	
a) Principal Forms	
1) Basic Forms	191
2) Limited-Variant Forms	192
3) Variant Forms	193
4) Signalling Forms	195
b) Other Color Light Signal Forms	
1) Distance Forms	196
2) Lens Arrangement Forms	197
3) Morphology & Other Forms	197
3 Searchlight Signal Forms	201
4 Other All-Lighted Terms	
a) Single Lens Units [Frequently Morphological	
Dimension]	
1) Terms Slightly More Morphological	
Than Physical	205

62

- 2) Somewhat More Morphological Than Physical 206
- b) Dwarf Signals [Frequently Multiple Lens] 206
- c) Undifferentiated Physical Forms 207

C Position Light, Color-Position Light & Symbolic Forms

- 1 Position Light Signal Terms 211
- 2 Color-Position Light Signal Terms 216
- 3 Symbolic Forms
  - a) Multi-Lamp Theatre Indicators 218
  - b) Stencil Indicators 219
  - c) Other Forms 220

D Cab Signalling

- 1 Major Cab Signal Forms 221
- 2 Forms (Operational) of Cab Signals 224
- 3 Partly Morphological Terms 226
- 4 Other Cab Signal Forms 227
- 5 Cab Signal with Sound Dimensions 228

CHAPTER THREE  
PARTIALLY-LIGHTED SIGNALS

A Indexes

- 1 Categories Index 230
- 2 Alphabetical Index 240

B Semaphore Signal Forms

- 1 Overarching Terms 250
- 2 Specific Forms
  - a) Lower Quadrant & Upper Quadrant Signal Forms 252

63

- b) Somersault Signals 254
- 3 Methods of Operation 255
- 4 Morphology-Related Terms 258

5	System-Related Terms	260
6	Other Forms	261
C	Signal Boards, Disc Signals & Other Forms	
1	Signal Boards	
a)	Overarching Terms & Terms in Other Languages	265
b)	Specific Board Terms	267
2	Disc Signals	
a)	Disc Signals [Containing the Word Disc]	269
b)	Banner Signals [Exposed Disc Forms Under the Banner Name]	273
3	Morphological-Related Terms	
a)	Switch Terms	276
b)	Point Indicators	276
c)	Route Indicators	276
d)	Track Indicators	283
e)	Other Forms	284

CHAPTER FOUR  
 UNLIGHTED, AUDIO & RADIO SIGNS,  
 SIGNALS, MARKERS, MOVABLE & TIME  
 INTERVAL & TRAIN ORDER FORMS

A	Indexes	
1	Categories	287
2	Alphabetical	313
B	Unlighted Fixed Forms with Constant Messages	
	General Note	339

64

1	Overarching Terms	339
2	Location Signs	340
3	Transportation Signs	341
a)	Speed Control & Restriction Signs	342
b)	Location Signs	
1)	Advance Location Signs	347
2)	Limits & Location Signs	348
3)	Territory Limit Signs	348
4	Maintenance of Way Signs	350
5	Safety Signs	352



& Other Forms	
General Note	414
1 Integrative Level Crossing & Grade Crossing Terms	414
2 Lighted Level Crossing & Grade Crossing Signals	
a) Free-Standing Signals	418
b) Signals Attached to Other Devices	422
3 Barriers & Gates	
General Note	423
a) Overarching Terms	423
b) Barriers, Full Barriers & Gates	
1) Automatic Barriers	423

66

2) "Manned" & Manually Operated Barriers	425
c) Half Barriers & Gates	426
4 Open Crossings	428
5 Sound Signals	429
6 Signs & Boards	432
7 Other Forms	432

## BIBLIOGRAPHY

i Books, Journals, Letters, Reports	434
ii Trade Literature	448
iii Signal Code Materials	432



*TRANSPORTATION-MARKINGS DATABASE:  
AERONAUTICAL NAVIGATION AIDS*

PREFACE	11
ABBREVIATIONS	12
CHAPTER ONE	
AERONAUTICAL LIGHTED AIDS	
A Indexes	
1 Categories Index	16
2 Alphabetical	47
B Overarching Terms: General & Visual Terms	
1 General Terms for all Aeronautical Terms	
a) Primary Terms	76
b) Specialized Terms	78
2 Visual Aids Terms	82
3 Sub-Overarching Terms	84
4 Overarching Terms for Lighted Aero Navigation Aids	
a) Light & Lighting Aids Terms	86
b) Airfield & Airport Light/Lighting Terms	87
5 Colors & Other Messages	
a) Colors	
1) Single Colors	93
2) Color Combinations	96
b) Historic Uses	96
c) Contemporary Usages	97

C Beacons & Obstruction Lighting	
1 Overarching Terms	100
2 Physical Apparatus	
a) Method of Operation-Related Terms	102
b) Dimension-Related Terms	103
c) Energy Source-Related Terms	106
3 Morphological Terms	
a) Airport Beacons	
1) Airfield & Airport Beacons	107
2) Code Beacons	109
b) Airway Beacons	111
c) Heliport Beacons & Other Forms	113
4 Miscellaneous Forms & Support Structures	
a) Miscellaneous Forms	114
b) Support Structures	115
5 Obstruction Lighting	116
a) Overarching Terms	117
b) Beacons	119
c) Obstruction Lights-Incandescent & Miscellaneous Forms	121
d) Obstruction Lights-Strobe & Composite Forms	122
D Approach Lighting	
1 Overarching Terms	
a) Major Terms	125
b) Secondary Terms	125
c) Sub-Overarching Terms	126
2 Equipment Terms	
a) Approach Lighting Systems	128
b) Physical/Morphological Terms	128
c) Support Structure Terms	130

3 Approach Lighting Systems	
a) Approach Lighting Systems	131
b) Special Approach Lighting Systems	137
c) Historic Terms	

1) Slope Line Systems	140
2) Center Line Systems	142
3) Other Historic Forms	144
4 Final Approach Indicators	
a) Overarching Terms	151
b) Precision Approach Path Indicators	153
c) VASI Systems	
1) Forms	156
2) VASIS: Types	158
d) Other Final Approach & Miscellaneous Forms	
1) Glide Path Forms	159
2) Tri-Color Forms	161
3) Fresnel Forms	161
4) PLASI Forms	162
5) Miscellaneous Forms	163
E Runway & Taxiway Lighting	
1 Runway Lighting	
a) Overarching Terms	166
b) Runway Edge Lights	168
c) Runway Centerline Lights	169
d) Threshold, Touchdown Zone, Runway End & Other Lights	171
e) Runway Equipment Terms	
1) General Terms	174
2) Physical Apparatus	175
3) Terms by Intensity	179
70	
2 Taxiway Lighting	
a) Overarching Terms	182
b) Taxiway Edge Lighting	184
c) Taxiway Centerline Lighting	184
d) Physical Apparatus & Other Terms	
1) Physical Apparatus	186
2) Other Terms	188
3 Historic & Composite Terms	
a) Historic Terms: Boundary, Contact & Range Lights	190
b) Composite Terms	191

## CHAPTER TWO SIGNS MARKINGS, MARKERS & MARKS

A Indexes	
1 Categories Index	193
2 Alphabetical Index	210
B Overarching Marks, Markers & Miscellaneous Terms	
1 Overarching Terms	226
2 Marks & Markers	
a) Overarching & Physical Marker Forms	227
b) Morphological Marker Forms	234
3 Other Forms	
a) Reflective Aids	244
b) Signal Panels, Signal Areas, Indicators, Other Objects & Miscellaney	247

71

C Signs & Markings	
1 Markings: Overarching, Runway & Taxiway Terms	
a) Overarching Terms	251
b) Runway Markings	253
c) Taxiway Markings	259
d) Markings Other Than Overarching, Runway, Taxiway	262
e) Special Categories	
1) Heliport & Vertiport Markings	269
2) Holding Position Markings	276
3) Obstruction Markings	278
4) Apron Markings	280
2 Signs	
a) Overarching Terms	281
b) Sign Forms Other Than Runway & Taxiway Types	284
c) Runway Signs	286

d) Taxiway Signs	288
e) Special Category: Holding Position Signs	289
f) Sign Forms-Other	291

## CHAPTER THREE

### RADIO AIDS

#### A Indexes

1 Categories Index	293
2 Alphabetical Index	315

72

#### B Radio Overarching Terms

1 General Terms	293
2 Sub-Overarching Radio Terms	341
3 Special Terms	342

#### C Terminal Aids/Aids to Final Approach & Landing

1 General Terms	346
2 Historic Terms	348
3 Instrument Landing Systems, ILS	
a) Principal Terms	357
b) Other Terms	358
c) Constituent Elements	
1) Component Terms	360
2) Early Terms: Conway 2006	365
4 Microwave Landing Systems, MLS	
a) Principal Terms	366
b) Constituent & Other Terms	367
c) MLS Systems & Constituent Terms: 1930s/1940s	369

#### D En-Route Aids

1 Historic Terms	
a) Early Terms	371
b) Intermediate Terms	373
2 VOR, VORTAC, DME & TACAN Forms	
a) VOR, VHF Omnidirectional Radio Range	378

b) Distance Measuring Equipment, DME	381
c) TACAN/Tactical Air Navigation	382
d) Composite Terms	383

73

3 Hyperbolic Aids	385
a) Overarching Terms	386
b) Loran	387
c) Decca	390
d) Consol	391
e) Omega	392
f) Miscellaneous Hyperbolic Aid Forms	393
4 Satellite Nav aids	
a) GPS	395
1) Main Terms	396
2) Specialized & Composite Terms	397
3) NAVSTAR GPS	398
4) GLONASS	399
b) Augmentation Terms	
1) DGPS	400
2) WAAS & LAAS Augmentation Terms	400
3) Other Augmentation Terms	404
c) GNSS	
d) Other Satellite Navigational Terms	
1) Satellite Navigation Terms	406
2) Transit & US Navy System Terms	409
3) Miscellaneous Terms	410
E Intercategory Group: Beacons	
1 Nondirectional Beacons (NDB)	413
2 Marks, Markers, Beacons	417
3 Direction Finding Terms	423

## BIBLIOGRAPHY

i	Books, Reports & Internet Resources	428
ii	Journals	432
iii	Government Publicans	438
iv	Trade Literature	448
v	Miscellaney	450

*T-M DATABASE: COMPOSITE CATEGORIES  
CLASSIFICATION & INDEX*

PREFACE	23
---------	----

CHAPTER ONE	
MARINE AIDS TO NAVIGATION	

A	Buoys & Other Floating Aids	
1	Physical Buoys	
a)	Overarching Terms	24
1)	Basic Overarching Terms	
2)	Other Overarching Terms	
3)	General Overarching Terms for Marine Aids to Navigation	
b)	Lighted Buoys	25
c)	Can & Conical Buoys	26
d)	Spar Buoys	26
1)	Basic Spar Buoys	
2)	Specialized Spar Buoys	
e)	Barrel & Cask Buoys	27
f)	Standard & Non-Standard Buoys	27
g)	Sound Buoys	
1)	Overarching Terms	
2)	Bell Buoys	
3)	Whistle Buoys	
4)	Siren Buoys	
5)	Other Sound Buoys	
h)	Combination Buoys	28
i)	Other Physical Buoy Terms	29
1)	Materials of Construction	

75

76

2)	Special Names Referring to Physical Structure	
3)	Other Specialized Terms	
2	Buoy Morphology Terms	
a)	Location Forms	30
1)	Approach Buoys	
2)	Channel Edge Buoys (or Channel Limit Buoys)	
3)	In-Channel Buoys	
b)	Hazard Buoys	31
c)	Buoy Names From Messages	31
d)	Names from Indirect Navigation Use	



Forms	32
1) Station Buoys	
2) Towing Buoys	
3) Anchor, Anchorage & Mooring Buoys	
e) Special Purpose Buoys	33
f) Miscellaneous Buoys	33
3 Excerpts from Buoy Adjunct Terms	33
4 Major Floating Aids Terms	34
a) Overarching Terms	
b) Lightship & Light Vessels	
c) Light Floats	
d) Large Navigational Buoys	
Notes: New Terms & Difference in Studies	35

77

<b>B Fixed Visual Aids</b>	
1 Fixed Lights	40
a) Overarching Terms	
1) General Overarching Terms	
2) Overarching Terms for Major Lights	
3) Overarching Terms for Minor Lights	
b) Major Lights	42
1) Subdivisions	
2) Major Lights-Individual Entries	
c) Minor Lights	44
1) Single-Member Structures	
(a) Narrower Types	
(b) Wider Types	
2) Multiple-Member Structures	
3) Enclosed/Composite/Single Structures	
d) Morphological Terms	45
1) Major Lights	
2) Minor Lights	
e) Character of Operations	47

1) Nature of Operations	
2) Specific Character of Light Operations	
f) Miscellaney	47
g) General Character of Lights	48
Notes: Major Lights: New Terms & Differences in Studies	48
Notes: Minor Lights: Differences in Studies	50
2 Daybeacons	
a) Overarching Terms	52
1) Basic Terms	
2) Shared & Foreign Language Terms	

78

b) Morphological Daybeacons	52
1) Leading/Range Marks	
2) Signals	
3) Other Morphology Terms	
c) Physical Daybeacon Forms	53
1) Unidirectional	
(a) Established Names	
(b) Local Names	
2) Structural Daybeacons	
(a) Structural Daybeacons Employing Overarching Terms	
(b) Established Names	
(c) Local/Descriptive Names	
3) Natural Marks	
Notes: Daybeacons: New Terms & Differences in Studies	56
C Acoustical & Radio Aids	
1 Acoustical Aids	
a) Fog Signal Overarching Terms	59
b) Diaphone, Diaphragm, Reed, & Siren Signals	
1) Diaphone Signals	
2) Diaphragm Signals	
(a) Overarching Terms	
(b) Diaphragm Signals-Compressed Air	
(c) Diaphragm Oscillator Signals	

3) Reed Horns	
4) Sirens	
c) Explosive, Percussion, Submarine & Whistle Signals	63
1) Explosive Signals	

79

2) Percussion Aids	
d) Submarine Signals	65
e) Whistles	65
f) Miscellaneous Signals	66
Notes: Acoustical Aids: New Terms & Differences in Studies	66
2 Radio Aids	
a) General Overarching Radio Aids Terms	72
b) Radiobeacon Overarching Terms	72
c) Radiobeacons-Main	73
1) Directional	
2) Nondirectional	
3) Rotating	
4) Composite	
d) Radiobeacons-Other	73
e) Radiobeacons-Character of Operation	74
f) Hyperbolic Aids: Overarching Terms, Loran & Decca Forms	74
1) Overarching Aids	
2) Decca	
3) Loran	
g) Hyperbolic Aids - Single & Quasi-Single	75
h) Partially Hyperbolic Forms	75
1) Consol Forms	
2) Raydist Forms	
i) Radar Aids: Reflectors	76
1) Overarching Terms & Primary Aids	
2) Shoran	
3) Transponder Beacons	
k) Satellite Navigation	77
1) Overarching & Other Terms	

80

2) GPS	
3) Navy Transit Satellite Navigation Systems	
4) Other Satellite Systems	
1) Other Radio Aids	78
1) Radio/Sound Aids	
2) Miscellaneous Aids	
Notes: New Terms & Differences in Studies	79

## CHAPTER TWO

### TRAFFIC CONTROL DEVICES

A Light & Sound Signals	
1 Traffic Control Signals	83
a) Overarching Terms & General Note	
b) Specific Entries	
c) Traffic Signal Operation	
2 Pedestrian Signals	84
3 Traffic Signals-Other Types	84
4 Flashing Beacons	84
a) Overarching Terms	
b) Specific Entries	
c) Lighting Devices	
5 Grade Crossing/Level Crossing Signals	85
6 Sound Traffic Signals	86
Notes: New Terms & Difference in Studies	86
B Warning Signs	
1 Categories & Overarching Terms	91
a) Categories	
b) Overarching Terms	
81	
2 Roadway Alignment Signs	91
a) Introductory Note & Overarching Terms	
b) Specific Signs	
3 Roadway Condition Signs	
a) Introductory Note & General Terms	92
b) Specific Signs	92



b) Prohibitory & Restrictive of Turns & U-Turns (About-Turns) Signs	125
c) Prohibitory & Restrictive of Overtaking (Passive) Signs	125
d) Prohibitory & Restrictive: Speed Limits Signs	125
e) Miscellaneous, Single Forms, & End of Prohibitve Or Restrictive Signs	125
4 Mandatory Signs	126
5 Standing & Parking Signs	128
6 Pedestrian Crossing Signs	129
7 Miscellaneous Regulatory Signs	129
8 Special Regulatory Signs: Temporary Traffic Control/Railroad Crossing/School/ Bicycles	129
Notes: New Terms & Differences in Studies	130

83

## E Traffic Markings

1 Overarching & Sub-Overarching Terms	
a) Overarching Terms with General Notes	135
b) Sub-Overarching Terms	136
1) More General Terms	
2) More Restricted Terms	
3) Transportation-Markings Studies Category Terms	
2 Pavement & Curb Markings	
a) Longitudinal Markings	136
1) Center Line Markings	
2) Edge Lines	
3) Lane Markings	
4) Other Longitudinal Markings	
b) Transverse Markings	138
c) Other Pavement & Curb Markings	139
3 Hazard, Obstruction, Delineation Markings	
a) Hazard & Obstruction Markings	140
b) Delineators	140
c) Barricades & Channelizing Devices	140

CHAPTER THREE  
RAILWAY SIGNALS, SIGNS, MARKERS

A General Railway Signal Terms

- 1 Overarching Terms
  - a) Signals 148
  - b) Fixed/Lineside/Railway-Railroad/  
Wayside Signals 148

84

- c) Other Overarching Terms 149
- d) Possible/Partial Overarching Terms 150
  - 1) Energy & Technology-Related Terms
  - 2) Physical-Morphological Overlapping  
Terms
  - 3) Possible Overarching Terms-  
Miscellaneous
  - 4) Terms Including Hardware Components
- 2 Message, Morphology & Systems Terms
  - a) Messages: Aspects & Indications 151
    - 1) Color
    - 2) Aspects
    - 3) Indications
  - b) Morphology 152
    - 1) Overarching Terms
    - 2) Stop Signals
    - 3) Starting Signal
    - 4) Distant Signals
    - 5) Systems
    - 6) Route & Junction Signals
    - 7) Other Signals-Running Operations
    - 8) Subsidiary Signals
    - 9) Physical Shunting Signals
    - 10) Function-Relation Shunting Signals
    - 11) Sidings, Train Yard & Other Signals
    - 12) Message-Related Signal Terms
    - 13) Miscellaneous Signals

c) Systems	157
1) Overarching Terms	
2) Manual Block Signal Systems	
3) Controlled Manual Block Signal Systems	

85

4) Automatic Block Signal Systems	
5) Absolute/Permissive Signals	
6) Other Block Signals	
7) Interlocking Signalling	
8) Train Control	
9) Specific Named Systems	
Notes: New Terms & Differences in Studies	159
B Fully & Partially-Lighted Signals	
1 Overarching Terms	162
2 Color Light Signals	
a) Principal Signal Types	162
1) Basic	
2) Limited-Variant	
3) Variant	
4) Signaling	
b) Other Color Light Signals	162
1) Distance Signals	
2) Lens Arrangement Terms	
3) Morphology & Other Terms	
3 Searchlight Signals	164
4 Other All-Lighted Signals	
a) Single Lens Units: Morphological Dimensions Frequently Present	1651
1) Signal Terms Slightly More Morphological Than Physical	
2) Signal Terms Somewhat More Morpholoical Than Physical	
b) Dwarf Signal [Frequently Multiple Lens]	165
c) Undifferentiated Physical Signals	166
5 Position Light, Color Position Light, & Alphanumeric, Graphic & Geometric Signals	

86



a) Position Light Signals	166
b) Color Position Light Signals	167
c) Symbolic Signal Types	167
General Note	
1) Multi-Lamp/Theatre Indicators	
Stencil Indicators	
3) Other Indicators	
6 Cab Signals	
a) Major Cab Signal Types	168
b) Operational Terms-Cab Signals	168
c) Partly Morphological Terms	169
d) Other Cab Signals	169
e) Cab Signals with Sound Dimension [Primarily Acoustical Signal segment]	170
7 Partially-Lighted Signals: Semaphores	
a) Overarching Terms	170
b) Types of Semaphores	170
1) Lower Quadrant & Upper Quadrant Signals	
2) Somersault Signals	
c) Semaphores: Methods of Operation	171
d) Semaphores: Morphologically-Related Terms	172
e) Semaphores: System-Related Terms	173
f) Other Semaphore Terms	174
8 Partially-Lighted Signals: Signal Boards, Disc Signals & Other Forms	
a) Signal Boards	175
1) Overarching Terms & Terms in Other Languages	
2) Specific Board Terms	
87	
b) Disc Signals	175
General Note	
1) Disc Signals Containing the Word Disc	
2) Banner Signals (Exposed Disc Form Under then Banner Name)	
c) Morphological-related Terms	177
General Note	

1) Switch Signals	
2) Points Indicators	
3) Route Indicators	
4) Other Morphological Signal Terms	
d) Other Signals	178
1) Crossbar Signals	
2) Flag Signals	
3) Lighted Signs & Boards	
4) Track Indicators	
5) Miscellaneous Signals	
Notes: New Terms & Differences in Studies	179
C Unlighted Visual Devices	
1 Unlighted Fixed Types with Constant Message	
General Note	187
a) Location Signs	187
b) Transportation Signs	187
1) Speed Control Signs	
(a) Speed Control & Restriction Signs	
(b) UAR Speed Signals (=Signs)	
(c) Speed Zone Signs	
(d) Other Speed Signs	

88

2) Location Signs	
(a) Advance Location Signs	
(b) Limit & Location Signs	
(c) Territory Limits Signs	
c) Maintenance of Ways Signs	190
d) Safety Signs	190
e) Marks & Markers	190
f) Board & Posts	192
g) Plates & Flags	194
h) Other Devices	194
1) Overarching Terms	
2) Blue Flags	
3) Electric Traction Signs	
4) Miscellaneous Signs	

2	Targets	
	General Note	195
	a) Overarching Terms	195
	b) Morphological-Related Terms	195
	General Note	
	1) Shape Targets	
	2) Color & Position Targets	
	3) Terms Relating to Railroad Functions	
	c) Other Targets	196
	d) Switch Targets	196
	Note: Signs: New Terms & Differences in Studies Including the Problems of Correlating Classifications & Database	197
D	Acoustical & Radio Signals	
	1 Acoustical Signal Terms	
	a) General Note & Overarching Terms	202
	b) Explosive Signals	202
	89	
	2 Radio Signal Terms	
	Note	204
	a) Overarching Terms	205
	b) Satellite Systems	205
	c) Other Radio Signals	205
	Note: New Terms, General Note & Differences in Studies	205
E	Level/Grade Crossing Signs, Signals, Markers & Other Devices	
	General Note	207
	1 Integrative Level Crossing/Grade Crossing Signals	207
	2 Lighted Level Crossing/Grade Signal Crossing Signals	208
	3 Barriers & Gates	
	a) Barriers, Full Gates, & Gates	209
	b) Half Barriers & Gates	210
	4 Sound Signals	210
	5 Signs	
	6 Open Crossings	212
	Note: New Terms & Differences in Studies	212

F Staff & Ticket, Tablet, Token, Train Order & Time Interval Signals	
1 Staff	214
2 Staff & Ticket	215
3 Token	215
4 Tablet & Tablet & Tokens	216
5 Tokenless Block Working	217
6 Train Order	217
7 Time Interval	217
8 Other Devices	218
90	
Note: New Terms & Differences in Studies	218

## CHAPTER FOUR AERO NAVIGATION AIDS

A Overarching Terms: General, Visual & Lighted Terms	
1 General Terms for All Aero Navigation Aids	
a) Primary Terms	220
b) Specialized Terms	220
2 Visual Aids Terms	221
3 Sub-Overarching Terms	222
General Note	
4 Overarching Terms for Lighted Aero Navigation Aids	
a) Light & Lighting Aids Terms	222
b) Airfield & Airport Light/Lighting Terms	222
B Beacons & Obstruction Lighting	
General Note	223
1 Overarching Terms	223
2 Physical Apparatus	
a) Method of Operation-Related Terms	224
b) Dimension-Related Terms	224
c) Energy Source-Related Terms	225
3 Morphological Terms	
a) Airport Beacons	225
1) Airfield & Airport Beacon	
2) Code Beacon	

b) Airway Beacon	226
c) Heliport & Other Beacons	226

91

4	Miscellaneous Beacons & Support Structures	
a)	Miscellaneous Beacons	227
b)	Support Structures	227
5	Obstruction Lighting	
	General Note	
a)	Overarching Terms	227
b)	Beacons	228
c)	Obstruction Lights-Incandescent & Miscellaneous Types	228
d)	Obstruction Lighting-Strobe & Composite Types	229
C	Approach Lighting	
1	Overarching Terms	227
a)	Major	229
b)	Secondary	230
c)	Sub-Overarching Terms	230
2	Equipment Terms	
a)	Physical Terms	230
b)	Physical/Morphological Terms	231
c)	Support Structures	232
3	Approach Lighting Systems	
	General Note	
a)	Approach Lighting Systems	232
b)	Special Approach Lighting Types	234
c)	Historic Terms	234
	1) Slopeline Systems	
	2) Center Line Systems	
	3) Other Historic Approach Lighting Systems	

92

4	Final Approach Equipment
---	--------------------------

a) Overarching Terms	238
b) Precision Approach Path Indicators	238
c) VASI Systems	239
1) Systems	
2) Operational Types	
d) Other Types	240
1) Glide Path	
2) Tri-Color	
3) Fresnel	
4) PLASI	
5) Miscellaneous Systems	
D Runway & Taxiway Lighting	
1 Runway Lighting	
a) Overarching Terms	241
b) Runway Edge Lights	241
c) Runway Centerline Lights	241
d) Threshold, Touchdown Zone, Runway End & Other Lights	242
e) Runway Equipment	243
1) General Terms	
2) Physical Apparatus	
3) Light Equipment By Intensity	
2 Taxiway Lighting	
a) Overarching Terms	246
b) Taxiway Edge Lighting	246
c) Taxiway Centerline Lighting	246
d) Physical Apparatus & Other Terms	246
1) Physical Apparatus	
2) Other Taxiway Lights	
93	
3 Historic & Composite Terms	
a) Historic Terms: Boundary, Contact & Range Lights	248
b) Composite Terms	248
Notes: New Terms & Differences in Studies	248
E Radio Aids	
1 Overarching Terms	
a) General Terms	255

b) Sub-Overarching Terms	256
c) Special Terms	256
2 Terminal Nav aids/Aids to Final Approach & Landing	
a) General Terms	257
b) Historic Terms	257
1) Overarching Terms	
2) Systems	
3) Components	
c) Instrument Landing Systems, ILS	259
1) Overarching Terms	
2) Other Terms	
3) ILS Components	
4) Microwave Landing Systems, MLS	
(a) Principal Terms	
(b) MLS Constituents & Other Terms	
3 En-Route Aids	
a) Historic Terms	262
1) Early Terms	
2) Intermediate Terms	
b) VOR/VORTAC/DME/TACAN Aids	263
General Note	
1) VOR, VHF Omnidirectional Radio Range	

94

2) Distance Measuring Equipment, DME	
3) TACAN/Tactical Air Navigation	
4) Composite Systems	
c) Hyperbolic Aids	265
General Note	
1) Overarching Terms	
2) Loran	
3) Decca	
4) Consol	
5) Omega	
6) Miscellaneous Hyperbolic Aids	
d) Satellite Nav aids	267
1) GPS	
(a) Overarching Terms	
(b) Specialized & Composite Terms	

(c) Navstar GPS	
(d) Glonass	
2) Augmentation Terms	
(a) DGPS	
(b) WAAS & LAAS Augmentation	
(c) GNSS	
(d) Other Satellite Navigational Systems	
(1) Satellite Navigation Terms	
(2) Transit & US Navy System	
(3) Miscellaneous Systems	
4 Intercategory Group: Beacons	
a) Nondirectional Beacons	272
b) Marks, Markers, Beacons	273
c) Miscellaneous Beacons	275
Notes: New Terms & Differences in Studies	276

95

F Signs, Markings, Markers & Marks	
1 General Notes & Overarching Terms	286
2 Marks & Markers	286
3 Other Forms	
a) Reflective Aids	289
b) Signal Panels, Signal Areas, Indicators, Other Objects & Miscellaney	290
4 Signs & Markings	
General Note	291
a) Overarching Terms	291
b) Runway Markings	291
c) Taxiway Markings	292
d) Markings Other Than Overarching, Runway, Taxiway, Special Categories	293
e) Special Category	295
1) Heliport & Vertiport Markings	
2) Holding Position Markings	
3) Obstruction Markings	
4) Apron Markings	
5 Signs	
a) Overarching Terms	298
b) Signs Other Than Runway & Taxiway	



Types	299
c) Runway Signs	300
d) Taxiway Signs	300
e) Special Category: Holding Position Signs	301
f) Signs-Other	
Notes: Differences in Studies	302
<b>BIBLIOGRAPHY</b>	<b>304</b>

*TRANSPORTATION-MARKINGS: A HISTORICAL SURVEY, 1750-200*

PREFACE	9
ACKNOWLEDGEMENT	
ABBREVIATIONS	

CHAPTER ONE  
PRELUDE TO MODERN  
TRANSPORTATION-MARKINGS HISTORY

A Early History of Transportation-Markings	
1 Survey of T-M Before 1750: Marine Aids	21
2 Survey of T-M Before 1750: TCDs	25
B Changes in the Context of T-M: The Industrial Revolution, 1750-2000	
1 Introduction & Early History	
a) Introduction & Terminology	26
b) Early History	27
2 The First Industrial Revolution, 1750-1850	
a) First Industrial Revolution, 1750-1830	29
b) Second Industrial Revolution, 1830-1870	32
3 New Industrial Revolution, 1871-1940	35
4 Third Industrial Revolution, 1940-2000	38

CHAPTER TWO  
VISUAL AIDS I, 1750-2000

A 1750-1870	
1 Introduction	41

97

2	Railway Signals	
a)	Early Railway Signals	42
b)	Developments in Railway Signals	44
3	Road Markings, Signs, Signal	45
4	Lighthouses & Other Fixed Lights	
a)	Structures	48
b)	Lighting	51
c)	Messages	53
5	Floating Aids	
a)	Buoys & Terminolog	55
b)	Messages	57
c)	Lightships	58
B	Visual Aids II, 1870-1920	
1	Introduction & Aero Aids	60
2	Traffic Control Devices, 1870-1920	
a)	Traffic Signs: Introduction	61
b)	Signs & Sponsoring Organization	62
c)	Traffic Signals	64
d)	Pavement Markings	67
3	Railroad Signals	
a)	Types of Signals: Introduction & Semaphores	61
b)	Types of Signals: Light Signals	69
c)	Messages: Colors	70
d)	Messages: Arm, Boards & Tablets	73
e)	Systems	75
4	Marine Aids to Navigation, 1870-1920	
a)	Introduction	76
b)	Illuminants, Burners & Accoutrements	77
c)	New Aids, 1870-1920	
d)	Messages & Systems	82

98

CHAPTER THREE  
VISUAL AIDS II, 1920-2000

A	Aeronautical Navigation Aids	
1	Introduction to Visual Aids II	85
2	Early Development of Visual Aero Aids, 1920-1943	
3	International Cooperation in Aero Aids	91
4	Development of Visual Aero Aids,	
	a) Visual Aids Other Than Approach Aids	92
	b) Approach Lighting	95
B	Marine Aids to Navigation	
1	Buoyage & Beaconage Systems, 1924-57	
	a) Introduction & IHB Efforts	100
	b) League of Nations Conferences & Systems	101
2	IALA Buoyage System	102
3	Visual Aids to Navigation in the 20th Century: On the Cusp of Decline?	104
C	Railway Signals	
1	Railway Signals & Expansion: 1920 & Beyond	
	a) Introduction	108
	b) Railway Signals	108
2	Railway Signal Systems	110
D	Traffic Control Devices, 1926-2000	
1	Traffic Control Devices, 1920-50	
	a) Introduction, Europe & League of Nations, 1926-1939	114
	b) Americas, Africa, Middle East, Asia & Pacific, Old British System, 1922-50	115
		99
	c) The 1949 UN Conference: The Protocol	121
2	Traffic Control Devices: New Directions & Changes, 1952-1968	
	a) UN GERSS 1952	123
	b) IAMM, ECAFE & Changes, 1952-68	124
3	Global Traffic Control Devices: UN Conference 1968 & Afterwards	127

## CHAPTER FOUR

## RADIO AIDS, 1904-2000

A Radio Nav aids: Early Days & En-Route Nav aids	
1 Introduction to Radio Nav aids	130
2 Early Days: Radio Nav aids Before 1920	131
3 Point-Source Aids	
a) Radio Range	133
b) Beacons	135
c) VOR, VOR/DME, VORTAC, TACAN	138
d) Radar Aids	140
B Hyperbolic Aids	
1 Introduction	143
2 Early Hyperbolic Aids	144
3 GEE & Loran Systems	
a) GEE	145
b) Loran	147
4 Decca Group of Nav aids	150
5 Other Radio Nav aids Forms	
a) Radux, Radux-Omega & Omega	153
b) Other Radionavigation Systems	154
100	
C Satellite Nav aids	
1 Introduction & Early Satellite Aids	155
2 Global Positioning Systems (GPS)	
a) Origins & Development	157
b) Augmentation	158
D Final Approach & Landing Aids	
1 Introduction & Early Years	162
2 Instrument Landing Systems	164
3 Microwave Landing Systems (MLS)	166

## CHAPTER FIVE SOUND SIGNALS

A Marine Fog Signals	
1 Fog Signals, 1750-1870	169
2 Fog Signals, 1870-1920	173

3 Fog Signals, 1920-2000	176
B Road, Rail, Aero Sound Signals	180
1 Road Sound Signals	180
2 Rail Signals	
a) Explosives	181
b) Cab Signals & Related Signals	183
c) Crossing Signals	184
d) Other Signals	186
3 Aero Signals	186

101

#### BIBLIOGRAPHY

i Books & Reports	189
ii Journals	199
iii Government Publications	204
iv Trade Literature	209
v The Bible in Translation (Jeremiah 31:21)	209

#### INDEXES

i T-M Types	211
ii Names	224

*T-M: AN INTEGRATIVE SYSTEMS PERSPECTIVE:  
COMMUNICATION, INFORMATION, SEMIOTICS*

PREFACE	8
CHAPTER ONE	
INTEGRATIVE T-M: COMMUNICATION/ INFORMATION/SEMIOTICS, INDICATOR & CONTEXT	
A Basic Terminology	
1 Communication/Information/Semiotics	
a) Introduction	
1) The Study	13
2) Chapter 2	14
b) Communication & Information	15
c) Semiotics/Semiology	18
2 a) Indicators	21
b) Other Terms	
1) Systems	
2) Integrative, ICT & Communication Model	25
Note 1 Indicators	26
Note 2 Communication Models	27
B Context: Routeways/Travelways	
1 Semiotic Context	28
2 Routeway Characteristics	
a) Introduction & General Characteristics	
1) Routewa Parameters	30
2) Supplemental Factors	31

103

b) Modal Characteristics	32
--------------------------	----

## CHAPTER TWO INDICATORS, MESSAGES, MEANINGS

A Foundations	
1 Basic Message Categories	35
2 Indicators as a Physical Object & Their Place in Message Categories	39
3 Formulation of Nature of Messages & Types	40
4 Small Categories of Messages	49
B Unchanging Messages/Single Messages	
1 Indicators	
a) Visual Indicators	
1) Introduction	51
2) Day-Night Aspects of T-M Forms	52
b) Fully-Lighted Forms	55
c) Partially-Lighted Forms	56
d) Unlighted Forms	60
e) Acoustic Devices	63
f) Electronic Devices	66
2 Messages & Meanings	
a) Introduction	71
b) Messages & Meaning	
1) Visual	
(a) Fully-Lighted Devices	72

104

(b) Partially-Lighted Devices	74
(c) Unlighted Devices	
i) Signs	76

ii) Marks/Markers/Markings	77
iii) Structures & Other Forms	79
2) Acoustic Devices	81
3) Electronic Devices	82
C Changing Messages/Multiple Messages	
1 Indicators	
a) Overview	84
b) Fully-Lighted Devices	85
c) Partially-Lighted & Unlighted Devices	86
2 Messages & Meanings	
a) Introduction	88
b) Meanings Before Messages	89
c) Messages & Meanings	90

## BIBLIOGRAPHY

i General & Communication, Information, & Semiotics (CIS) Sources	95
ii Transportation & T-M Sources	99

## INDEX

i General Terms	105
ii Names	107
iii Indicators	109

“Under classification we may include all arrangements of objects or names, which we make for saving labour in the discovery of an object. Even alphabetical indices are real classifications. No such arrangement can be of use unless it involves some correlation of circumstances, so that knowing one thing we learn another. If we merely arrange letters in



the pigeon-holes of a secretaire we establish a correlation, for all letters in the first hold will be written by persons, for in-stances. whose names begin with A, and so on. Knowing then the initial letter of the writer's name, we know also the place of the letter, and the labour of search is thus reduced to one twenty-sixth part of what it would be without arrangement."

W. Stanley Jevons, *The principles of Science: A Treatise on Logic and Scientific Method.*  
(Chapter XXX, Classification).  
1st edition, 1874, 2nd edition, 1877  
Dover edition (New York), 1958

## INDEX T-M FORMS

Absolute/Permissive Signals, 85  
Absolute/Permissive Systems, 60  
Acoustic Devices, 103, 104  
Acoustical Aids, 79  
Acoustical & Radio Aids, 78  
Acoustical & Radio Signals, 64, 88  
Acoustical Signals, 64, 88  
Advance Location Signs, 64, 88  
Aero Aids, 37  
Aero Electronic Navigation Aids, 39  
Aero Nav Aids, 37, 40  
Aero Navigation Aids, 37, 41, 42, 90  
Aero Signals, 100  
Aeronautical Lighted Aids, 67  
Aeronautical Navigation Aids, 18, 37, 67, 98,  
Aero T-M/Aeronautical T-M, 37  
Aids, 40, 97  
Aids for Surface Transportation, 42  
Aids for Water & Air Transportation, 42  
Aids to Final Approach & Landing, 72  
Airfield & Airport Beacons, 68, 90  
Airfield & Airport Lights/Lighting, 67, 90  
Airport Beacons, 68, 90  
Airway Beacons, 68, 90

All-lighted Signals, 34, 61  
Anchor, Anchorage & Mooring Buoys, 45, 76  
Approach Aids, 98  
Approach Buoys, 45, 76  
Approach Lighting Systems, 38, 68, 91, 98

107

108

Approach Lighting Systems, 68, 69, 91  
Apron Markings, 71  
Arms, Boards, & Tablets, 97  
Automatic Barriers, 65  
Automatic Block System, 60, 85

Banner Signals, 63, 87  
Barrels & Cask Buoys, 44, 75  
Barricades & Channelizing Devices, 57, 83  
Barriers & Gates, 65, 89  
Barriers, Full Barriers & Gates, 65, 89  
Beacons, 38, 73, 91, 94, 99  
Beacons & Multi-mode Radio Aids, 39  
Beacons & Obstruction Light, 39  
Beacons & Obstruction Lighting, 38, 68, 90  
Bell Buoys, 75  
Bells, 49  
Block Signals, 85  
Block Systems, 60  
Blue Flags, 64, 88  
Board & Posts, 64, 88  
Boundary, Contracts, & Range Lights, 70, 93  
Buoy System, 21  
Buoyage, 21  
Buoyage & Beaconage Systems, 98  
Buoyage Systems, 21, 22, 98  
Buoys, 20, 21, 25, 45, 76, 97  
Buoys & Buoyage Systems, 20  
Buoys & Other Floating Aids, 75

Cab Signalling, 62,  
Cab Signals, 86  
Cab Signals & Related Signals, 100  
Cab Signal & Traffic Control Sound Signals, 65  
Cab-Signal, 86  
Can & Conical Buoys, 75  
Can/Cylindrical Buoys, 21  
Can & Cone Buoys, 44  
Center Line Markings, 56, 83  
Center Line Systems, 69, 91  
Channel Edge Buoys, 45, 76  
Channel Limits Buoys, 45, 76  
Code Beacons, 68, 90  
Color & Position Targets, 88  
Color Light Signals, 61, 85  
Color-Light Signals, 34  
Color Position Light Signals, 86  
Color-Position Light Signals, 62  
Combination Buoys, 44, 75  
Combination Forms, 49  
Composite Radiobeacon, 79  
Composite Systems, 94  
Conical Buoys, 21  
Conical & Can/Cylindrical Buoys, 21  
Construction & Maintenance Signs, 53, 84  
Consol, 50, 73, 79, 94  
Controlled Manual Block Signal System, 60, 84  
Corner Reflectors, 50  
Crossbar Signals, 87  
Crossing Signals, 100  
CTC, 61

Danger Warning Signs, 28  
Daybeacons, 23, 25, 47, 48, 77, 78  
Daymarks, 48  
Decca, 73, 94, 99

Decca Aids, 50  
Delineators, 57, 83,  
Destination & Direction Signals, 52, 81  
DGPS, 73, 94  
Diaphone Fog Signal, 49, 78  
Diaphone, Diaphragm, Reed & Siren Signals, 78  
Diaphragm Horn, 49, 78  
Diaphragm Signals, 49  
Diaphragm Signals-Compressed Air, 78  
Diaphragm Signals-Oscillator, 78  
Direction Finding, 73  
Directional Radiobeacon, 79  
Disc Signals, 63, 87  
Distance Signals, 84, 85  
Distant Signals, 59  
Distance Measuring Equipment, DME, 72, 94  
Dwarf Signals, 62, 85

Edge Lines Markings, 56  
Electric Traction Forms, 64  
Electric Traction Signs, 64, 88  
Electronic Devices, 103, 104  
Electronic Navigation Aids, 18  
Electronic T-M, 13  
Elevated Lights, 38  
Elevated Markings, 18

111

Enclosed/Composite/Single Structures, 77  
End of Prohibitive or Restrictive Signs, 55  
En-Route Aids, 72, 93  
Exclusion Categories of Vehicles Forms, 54  
Exclusion Signs, 54  
Explosives, 100  
Explosive, Percussion, Submarine & Whistles, 78  
Explosive Signal, 49, 64, 78, 88

Final Approach Equipment, 92  
Final Approach Indicators, 69

Final Approach & Miscellaneous Forms, 69  
Final Approach & Landing Aids, 100  
Final Approach Lighting, 38  
Fixed Aids, 18, 41  
Fixed Lights, 46, 77  
Fixed Lighted Markings, 22  
Fixed/Lineside/Railway-Railroad/Wayside Signals, 58, 83  
Fixed Marine Lights, 22  
Fixed Visual Aids, 22  
Fixed Visual Markings, 20  
Flag Signals, 87  
Flashing Beacons, 55, 80  
Floating Aids, 18, 45, 76, 97  
Floating Aids to Navigation, 21  
Fog Signals, 24, 48, 78, 100  
Free-Standing Geometric Signals, 35  
Free-Standing Signals, 65  
Fresnel Forms, 69, 92  
Fully & Partially Lighted Signals, 85  
Fully-Integrated Semaphore Signals, 35

112

Fully Integrated Systems, 39  
Fully-Lighted Devices, 103, 104  
Fully-Lighted Forms, 103  
Function-Relation Shunting Signals 84

GEE, 99  
GEE & Loran Systems, 99  
General or Alternate Danger Signs, 53, 81  
Geometric & Graphic Signals, 35  
Geometric Signals, 35  
Glide Path, 92  
Glide Path Forms, 69  
Global Positioning System (GPS), 80, 100  
GLONASS, 73, 94  
GNSS, 73, 94  
Gongs, 49  
GPS, 50, 73, 80, 94  
Grade Crossing/Level Crossing Signals, 80

Graphic, Geometric, & Alphanumeric Signals, Types, 34  
Graphic & Geometric Signals, 35  
Graphic Signals, 35

Half Barriers & Gates, 66, 89  
Hazard & Delineation Markings, 57  
Hazard & Obstruction Markings, 83  
Hazard, Obstruction, Delineation Markings, 83  
Hazard/Obstruction Markings, 57  
Hazard Buoys, 45, 76,  
Hazard Signs, 53, 81  
Heliport Beacons & Other Forms, 68  
Heliport & Other Beacons, 90

113

Heliport & Vertiport Markings, 71, 95  
Holding Position Markings, 71, 95  
Holding Position Signs, 71, 95  
Horizontal Markings, 56  
Hyperbolic Aids, 24, 73, 79, 94, 99  
Hyperbolic Forms, 50

IALA Buoyage System, 22  
ILS, 93  
IMC-Influenced Buoyage Systems, 22  
In-Channel Buoys, 76  
Independent & Partially Integrated Aids, 39  
Indicators, 39, 86  
Indicators, Markers, Obstruction & Restricted  
Use Markings, 39  
Indirect Navigation Buoys, 45  
Informative Signs, 28, 52, 81  
Inset Lights, 38  
Inset & Elevated Lights, 38  
Instrument Landing Systems (ILS), 39, 72, 93, 100  
Integrative Level Crossing & Grade Crossing Terms, 65  
Integrative Level Crossing/Grade Crossing Signals, 89  
Interlocked Signalling, 60, 85  
Intersection Signs, 53, 81  
Intermittent Moving Hazards Signs, 53, 60, 81

Lane Markings, 56, 83,  
Large Navigational Buoys, 46  
Large Navigational Buoys, 76  
Leading/Range Marks, 48, 78

114

Level Crossing/Grade Crossing Sound Signals, 65  
Level/Grade Crossing Signs, Signals, Markers, 65  
Level/Grade Crossing Signs, Signals, Markers & Devices, 89  
Level/Grade Crossing Signs, Signals, Markers & Other  
Forms, 89  
Light & Lighting Aids, 67, 90  
Light & Sound Signals, 80  
Light Equipment, 92  
Light Float, 76  
Light Signals, 97  
Lighted Aero Navigation Aids, 38, 67, 90  
Lighted Aids, 23  
Lighted Buoys, 44, 75  
Lighted Level Crossing & Grade Crossing Signal, 65  
Lighted Level Crossing/Grade Crossing Signal, 89  
Lighted Navigation Aids, 18  
Lighted/Partially Lighted Signals, 19  
Lighted Signs & Boards, 87  
Lighthouses & Other Fixed Lights, 97  
Lighting Devices, 56, 80  
Lighted & Lighted-Sound Buoys, 21  
Lighted Marine Markings, 18  
Lighted-Sound Buoys, 21  
Lighthouses, 22  
Lights, 47, 78  
Lightships, 97  
Lightships & Light Vessels, 45, 46, 76  
Limits & Location Signs, 64, 88  
Lineside Signals, 58, 83  
Location Signs, 64, 87, 88  
Longitudinal Markings, 83



Loran Aids, 50, 94, 99  
 Lower Quadrant & Upper Quadrant Signals, 62  
 Lower Quadrant Forms, 62  
  
 Maintenance of Way Signs, 64, 88  
 Major & Minor Forms, 22  
 Major Floating Aids, 45  
 Major Lights, 23, 46, 77  
 Mandatory Signs, 55, 82  
 “Manned” & Manually Operated Barriers, 66  
 Manual Block Signal System, 60, 84  
 Marine Aids, 96  
 Marine Aids to Navigation, 18, 20, 24, 42, 75, 97, 98  
 Marine Aids to Navigation with Floating & Fixed Aids  
     Submodes with Notes, 41  
 Marine Fog Signals, 100  
 Marks, 45  
 Marks & Markers, 64, 70, 88, 95  
 Marks, Markings & Miscellaneous Terms, 70  
 Marks, Markers, Beacons, 73  
 Mark, Marker, Marking, 104  
 Mark/Marker/Marking, 104  
 Markers, 39  
 Markings, 39  
 Markings & Signs, 35  
 Markings, Other Than Overarching, Runway, Taxiway, 71  
 Markings: Overarching, Runway & Taxiway, 71  
 Markings Other Than Overarching, Runway  
     Taxiway, 71  
 Microwave Landing Systems (MLS), 39, 72, 93, 100

Mileposts, 52, 81  
 Minor Lights, 23, 46, 77  
 Miscellaneous Aids, 80  
 Miscellaneous & Single Forms, 54  
 Miscellaneous Signs & Single Category Signs, 82

Miscellaneous Buoys, 45, 76  
Miscellaneous Forms, 50, 69  
Miscellaneous Beacons, 91, 94  
Miscellaneous Hyperbolic Aids Forms, 73, 94  
Miscellaneous Regulatory Signs, 55, 82  
Miscellaneous Signals, 49, 79, 87  
Miscellaneous Signs, 64, 88  
Miscellaneous Signs, Single Forms, & End of Prohibitive  
or Restrictive Signs, 55, 82  
Miscellaneous Systems, 92, 94  
MLS, 93  
MLS Systems & Constituents Terms, 72, 93  
Multiple-Member Structures, 77  
Multi-Lamp Theatre Indicators, 62  
Multi-Lamp/Theatre Indicators, 86  
Multi-Mode Radio Aids, 39

Natural Marks, 48, 78  
Nav aids, 99  
Naval Transit Satellite Navigation Systems, 80  
Navstar GPS, 73, 94  
Nondirectional Beacon, 73, 94  
Nondirectional Beacon (NDB), 99  
Nondirectional Radiobeacon (NDB), 73  
Non-Sign Markings, 35

117

Obstruction Lights, 39  
Obstruction Lighting, 68, 91  
Obstruction Lights-Incandescent & Miscellaneous, 68, 91  
Obstruction Lights-Strobe & Composite, 68, 91  
Obstruction Markings, 39, 71, 95  
Omega, 73, 94  
One-Way & Both Direction Forms, 54, 82  
Open Crossings, 66, 89  
Oscillator, 78  
Other Devices, 88  
Other Hazards Signs, 81  
Other Signals-Running Operations, 84

Parking Signs, 52, 81  
Partially & Non-Integrated Semaphore Models, 35  
Partially Hyperbolic Aids, 79  
Partially Hyperbolic Forms, 50  
Partially-Lighted & Unlighted Aero Navigation Aids, 39  
Partially-Lighted & Unlighted Signals, Signs, Markings, 24  
Partially-Lighted Devices, 104  
Partially-Lighted Forms, 103  
Partially-Lighted Signals, 62  
Partially-Lighted Signals: Semaphores, 86  
Partially-Lighted Signals: Signal Boards, Disc Signals  
& Other Forms, 86  
Pavement & Curb Markings, 56, 82  
Pavement Markings, 97  
Pedestrian Crossing Signs, 55, 82  
Pedestrian Signals, 49, 55, 80  
Percussion Aids, 79  
Percussion Signals, 49

118

Physical Apparatus & Other Terms, 70  
Physical Buoys, 75  
Physical Daybeacons, 78  
Physical Pavement Markings, 56  
Physical Shunting Signals, 60, 84  
Physical Signals, 85  
PLASI Forms, 69, 92  
Plates & Flags, 88  
Plates & Flags Forms, 64  
Point-Source Aids, 99  
Points Indicators, 63, 87  
Position & Color-Position Signals, 34  
Position-Light & Color-Position Signals, 34  
Position Light, Color Position & Alphanumeric, Graphic  
Geometric Signals, 62, 85  
Position Light, Color-Position Lights & Symbolic Forms, 62  
Position Light Signals, 62, 86  
Precision Approach Path Indicator, 69, 92  
Priority Signs, 54, 82

Prohibitory & Restrictive of Entry Signs, 54  
Prohibitory & Restrictive: Overtaking (Passing) Signs, 54, 82  
Prohibitory & Restrictive Signs, 54, 82  
Prohibitory & Restrictive: Speed Limit Signs, 54, 55, 82  
Prohibitory & Restrictive: Turns & U-Turns Signs, 54  
Prohibitory & Restrictive of Turns & U-Turns (About  
Turns) Signs, 82

Radar Aids, 99  
Radar Aids: Reflectors, 79  
Radar, Satellites, & Other Forms, 50  
Radar: Secondary & Primary Radar, 50

119

Radar Primary Forms, 50  
Radar Reflectors, 50  
Radar Reflectors: Other Forms, 50  
Radio Aids, 49, 71, 79, 80, 93, 99  
Radio Aids to Navigation, 23  
Radio Navaids, 99  
Radio Overarching Terms, 72  
Radio, Radar & Miscellaneous Systems, 24  
Radio Range, 99  
Radio Signals, 65, 89  
Radiobeacons, 49, 79  
Radionavigation Systems, 99  
Radio/Sound Aids, 80  
Radux, Radux-Omega & Omega, 99  
Railroad Signals, 97  
Railroad Signals & Other Devices, 16  
Rail Signals, 100  
Railway Indicators, 18  
Railway Marks, 88  
Railway Markers, 88  
Railway-Railroad Signals, 58  
Railway Signalling, 32  
Railway Signal Systems, 98  
Railway Signals, 32, 58, 83, 97, 98  
Railway Signals, Signs & Indicators, 18  
Railway Signals, Signs, Marks, Markers, 41, 58

Railway Signals, Signs, Markers, 42, 83  
Railway Signs, 35  
Raised Pavement Markers, 56  
Raydist Aids, 50, 79  
Recreation Signs, 52, 82

120

Reeds, 49  
Reed Horns, 78  
Reflective Aids, 70, 95  
Regulatory Signs, 29, 54, 82  
Restricted Use Area Visual Aids, 39  
Restricted Use Markings, 39  
Road Markings, Signs, Signals, 97  
Road, Rail, Aero Sound Signals, 100  
Road Signs, 19, 30  
Road Sound Signals, 100  
Roadway Alignment Signs, 53, 81  
Roadway Condition Signs, 53, 81  
Rotating & Revolving Discs & Panels, 35  
Rotating Radiobeacons, 79  
Route & Junction Signals/Indicators, 59, 60, 84  
Route Indicators, 63, 87  
Route Markers, 52, 81  
Route-Marker Tabs, 81  
Running Signals, 59  
Runway Centerline Lights, 69, 92  
Runway Edge Lights, 69  
Runway Equipment, 69, 92  
Runway Markings, 71, 95  
Runway & Taxiway Lighting, 38, 69  
Runway & Taxiway Markings, 92  
Runway Lighting, 69, 92  
Runway Signs, 71, 95  
  
Safety Signs, 64, 88  
Satellite Aids, 100  
Satellite-Based Navigation, 24

121

Satellite-Based Navigation & Hyperbolic Aids, 24  
Satellite Nav aids, 73, 94  
Satellite Navigation, 50, 79, 94  
Satellite Navigational Forms, 73  
Satellite Navigational Systems, 94  
Satellite Systems, 80, 89  
Searchlight Signals, 61, 85  
Secondary & Primary Radar Forms, 50  
Semaphore Signals, 35, 62, 86, 97  
Semaphoric Signals, 34  
Service Signs, 52, 81  
Shape Targets, 88  
Shoran, 50, 79  
Shunt Signal/Indicators, 60  
Shunting Signals, 60  
Siding, Train Yards & Other Signals, 60, 84  
Signal Boards, 35, 63, 86  
Signal Board, Disc Signals & Other Forms, 63  
Signal Panels, Signal Areas, Indicators, 70, 95  
Signals, 27, 32, 33, 34, 36, 48, 58, 60, 83, 84, 85, 87, 97,  
100, 104  
Signals Attached to Other Devices, 65  
Signal Systems, 33  
Signal & Points Indicators/Signals, 60  
Signals, Signs, Markings, 33, 34  
Signaling, 85  
Signalling, 61  
Signs, 28, 29, 30, 39, 52, 71, 81, 88, 89, 95, 97  
Signs & Boards, 66  
Signs & Markings, 19, 33, 39, 71, 95  
Signs & Pavement Markings & Elevated Markings, 18

122

Sign Forms-Other, 71  
Signs Giving General Information, 52, 81  
Signs, Markings & Related Devices, 18  
Signs & Unlighted Signals, 19  
Signs, Markings, Markers & Marks, 95  
Sign Forms Other Than Runway & Taxiway Types, 71

Signs, Signals & Markings, 36  
Single Forms of an Unitary Nature: Past & Present, 44  
Single Lens Units, 85  
Single Category Signs, 82  
Single-Member Forms/Structures, 77  
Siren Buoys, 75  
Sirens, 49, 78  
Slopeline Systems, 69, 91  
Somersault Signals, 63  
Sound Buoys, 21, 44, 75  
Sound-Radio Aids, 50  
Sound/Radio Forms, 50  
Sound Signals, 66, 89, 100  
Sound Traffic Signals, 80  
Spar Buoys, 44, 75  
Spars, Standards & Miscellaneous Buoys, 21  
Special Purpose Buoys, 45, 76  
Special Regulatory Signs: Temporary Traffic Control/  
Railway Crossing/Schools/Bicycles, 82  
Speed Control, 60  
Speed Control Signs, 87  
Speed Control & Restriction Signs, 64, 87  
Speed Signs, 87  
Speed Zone Signs, 87  
Staff, 65, 89

123

Staff, Tablet, Tickets & Tokens, 36  
Staff & Ticket, 65, 89  
Staff & Ticket, Tablet, Token, Train Order & Time  
Interval Signals, 65  
Staff, Ticket, Token, Tablet, Train Order & Time  
Interval, 65, 89  
Standard & Non-Standard Buoys, 75  
Standing & Parking Signs, 55, 82  
Standard Buoys, 21  
Starting Signals, 59, 84  
Station Buoys, 45, 76  
Stencil Indicators, 62, 86  
Stop, Distant & Related Signal Terms, 59

Stop Signals, 59, 84  
Structural Daybeacons, 78  
Submarine Signals, 49, 79  
Subsidiary Signals, 60, 84  
Supplemental Plates/Plaques, 53, 181  
Surface Transportation-Markings, 41  
Switch Indicators, 60  
Switch Indicators/Signal & Points Indicators/Signals, 60  
Switch Signals, 87  
Switch Stands, 64  
Switch Stand Terms, 64  
Switch Targets, 88  
Switch Terms, 63  
Symbolic Forms, 62  
Symbolic Signals, 86

Tablets, 65  
Tablets & Tablets & Tokens, 65, 89

124

TACAN/Tactical Air Navigation, 72, 94  
Targets, 64, 88  
Taxiway Centerline Lighting, 70  
Taxiway Edge Lighting, 70, 82  
Taxiway Lights, 92  
Taxiway Lighting, 70, 92  
Taxiway Marking, 71, 95  
Taxiway Signs, 71, 95  
TCDs, 27, 28, 96  
Terminal Aids, 72  
Terminal Nav aids/Aids to Final Approach & Landing, 72, 93  
Territory Limits Signs, 64, 88  
Threshold, Touchdown Zone, Runway Ending & Other  
Lights, 69, 92  
Time Interval, 89  
Time Interval Forms, 65  
Tokens, 65, 89  
Tokenless Forms, 85  
Tokenless Block Working, 89,  
Towing Buoys, 45, 76



Track Indicators, 63, 87  
Traffic Control, 61  
Traffic Control Devices, 18, 23, 26, 42, 57, 80, 97, 98, 99  
Traffic Control Signals, 18, 80  
Traffic Markings, 26, 29, 56, 83  
Traffic Signals, 26, 28, 55, 83  
Traffic Signs, 26, 57, 97  
Train Control, 60, 85  
Train Order, 89  
Train Order Forms, 65  
Train Stop, 65

125

Transit & US Navy Systems, 73, 94  
Transponder Beacons, 50, 79  
Transportation Signs, 64, 87  
Transverse Markings, 56, 83  
Tri-Color Forms, 69, 92

UAR Speed Signals, 87  
Unidirectional [Daybeacons], 49  
Uniform System of Buoys (USB), 22  
Unlighted Aero Navigation Aids, 39  
Unlighted Audo & Radio, Signs, Signals, Markers, Movable  
& Time Interval & Train Order Forms, 63  
Unlighted Buoys, 21  
Unlighted Fixed Forms, 63  
Unlighted Devices, 104  
Unlighted Forms, 103  
Unlighted Signals, 19  
Unlighted Visual Devices, 89  
Upper Quadrant Signals, 62  
US Navy Systems, 73

VASI Systems, 69, 92  
VASIS, 69  
Vehicular Exclusion: Weight, Height & Length Forms, 54, 82  
Visual Aero Aids, 98  
Visual Aids, 67, 90, 96, 97, 98  
Visual Aids to Navigation, 98

Visual & Lighted Terms, 90  
VOR, 72  
VOR, VHF Omnidirectional Radio Range, 72, 93  
VOR, VORTAC, DME & TACAN Forms, 72

126

VOR/VORTAC-DME/TACAN,  
VOR/VORTAC/DME/TACAN Aids, 93  
VOR, TACAN, VORTAC & DME, 39  
VOR, VOR/DME, VORTAC, TACAN, 99

WAAS & LAAS, 73, 94  
Warning & Informative Signs, 28  
Warning Signs, 53, 80  
Water & Air Transportation-Markings, 41  
Wayside Signals, 58  
Whistles, 49, 79  
Whistle Buoys, 75

127

## INDEX - TOPICS

Acoustics, 13, 14, 15, 41, 64, 78, 79, 88, 103, 104,

Classification/Taxonomy, 11, 12, 17, 18, 19, 20, 21, 22, 23,  
24, 27, 29, 30, 32, 33, 37, 38, 41, 42, 43, 45

Color, 12, 30, 33, 34, 59, 61, 62, 64, 67, 84, 85, 86

Communication, 11, 12, 15, 17, 102, 104

Culture, 14, 15

Design, 14, 15

Electronics, 13, 15, 18, 39, 41, 104

History, 12, 14, 15, 20, 22, 23, 24, 32, 37, 67, 69, 70, 72,  
91, 93, 96

Holarchy/Holon/Holonarchy/Holonomy, 11, 12

Information, 102, 104

Light, 12, 22, 23, 25, 34, 38, 39, 45, 46, 47, 61, 62, 67, 68,  
69, 70, 80, 85, 86, 90, 91, 92, 93, 97

Lighted, 18, 19, 21, 23, 34, 38, 39, 41, 44, 49, 61, 62, 67, 75,  
85, 86, 87, 89, 90, 103, 104

Lighting, 38, 56, 67, 68, 69, 70, 80, 91, 92, 98

Meanings, 15, 33, 104

Messages, 12, 13, 14, 15, 17, 19, 21, 23, 24, 27, 28, 30, 34,  
35, 36, 38, 39, 42, 45, 52, 53, 54, 55, 59, 60, 62, 67, 76, 84,  
87, 97, 103, 104

Methodology, 20, 32, 37

128

Morphology, 45, 46, 48, 56, 58, 59, 61, 62, 63, 64, 68, 70,  
76, 77, 78, 84, 85, 86, 87, 88, 90, 91

Nomenclature, 12, 17, 42, 43,

Physical Dimensions, 17, 37, 44, 56, 58, 60, 61, 62, 68, 70,  
75, 78, 84, 85, 90, 92

Science & Technology, 15

Semantics, 12

Semiotics, 11, 12, 15, 17, 20, 32, 37, 102, 104,

Sound, 21, 62

Symbols, 11, 15, 62, 86

Systems, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 33, 36, 39, 40,  
45, 59, 60, 61, 63, 69, 72,73, 80, 84, 85, 89, 91, 92, 93, 94,  
97, 98, 99, 100, 102

Technology, 15, 20, 58

Terminology, 14, 15, 35, 37, 38

Transportation, 15, 41, 42, 104

Visual, 15, 20, 39, 67, 98, 103

129

## INDEX - GENERAL PREFACE

Classification, 6

Communication, 6, 7

Culture, 6

Design, 6

Engineering, 6

History, 6

Holarchy, 6

Information, 7

Linguistics, 8

Message, 8

Physical Apparatus,

Road Signs, 8, 9

Safety Aids, 6, 8, 9

Semiotics, 6, 7, 8, 11, 12, 17

Signs, 8, 9

Sign Theory, 8, 9

Symbols/Symbolic, 8

130

Technology, 6

Transport Marks, 8

Transportation, 6, 7, 8

Visual, Sound & Electronic Devices, 8

Waymarks, 8

“We Communicate and Navigate  
with a code of Logos, Symbols,  
Emblems and Signs.”

Susan Yalevich, *Design for Life: Our  
Daily Lives, the Space we Shape, and the Ways we  
Communicate, as seen through the collections of  
Cooper-Hewitt National Design Museum.*

New York: Cooper-Hewitt, National  
Design Museum, Smithsonian  
Institution: Rizzoli 1997

