Contents

List of Figi	ures	ix
List of Tab	les	xii
Foreword		xı
Preface		xvi
Acknowled	lgements	xix
List of Abb		XX
PART 1	MULTIMODAL CHARACTERISTICS OF SAFETY MANAGEMENT SYSTEMS	1
1	Can Simply Correcting the Deficiencies Found through Incident Investigation Reduce Error? Gerry Gibb, Safety Wise Solutions Pty Ltd	3
2	Moving Up the SMS Down Escalator Bruce Tesmer, Continental Airlines	13
3	Unsafe or Safety-Significant Acts? David McNair, Transportation Safety Board of Canada	17
4	The Calgary Health Region: Transforming the Management of Safety Jack Davis, Calgary Health Region, Jan M. Davies, University of Calgary and Ward Flemons, Calgary Health Region	31
5	Governance and Safety Management Greg Marshall, National Air Support	41
6	Overcoming the Short-Medium-Term Problems of Fleet Transition: The Expectation and Achievement of Economic Gain Boyd Falconer and Christopher Reid, University of New South Wales and Jetstar Airways	s 51
PART 2	SAFETY MANAGEMENT METRICS, ANALYSIS AND REPORTING TOOLS	59
7	A New Reporting System: Was the Patient Harmed or Nearly Harmed? Jan M. Davies, University of Calgary Carmella Duchscherer and Glenn McRae, Calgary Health Regio	61 n
	Cui mona Ducinolici ci ana Gionni monac, Cangary meann negio	••

vi	Multimodal Safety Management and Human Factors	
8	Using Aviation Insurance Data to Enhance General Aviation Safety: Phase One Feasibility Study Michael Lenné, Paul Salmon, Michael Regan, Narelle Haworth and Nicola Fotheringham, Monash University Accident Research Centre	73 h
9	Grappling with Complexity: Analysing an Accident with the Theory of Constraints Dmitri Zotov, Alan Wright and Lynn Hunt, Massey University	83
10	Drought in Safety Management – More Tools, Less Theory Steve Tizzard, Civil Aviation Safety Authority (CASA), Australia	107
11	Aerial Agriculture Accidents 2000–2005: The Human Factors and System Safety Lessons Geoff Dell, Protocol Safety Management Pty Ltd and the Safety Institute of Australia	113
12	Learning from Accidents and Incidents Joanne De Landre, Safety Wise Solutions Pty Ltd Miles Irving, Iaen Hodges and Bruce Weston, RailCorp	131
13	Managing Road User Error in Australia: Where Are We Now, Where Are We Going and How Are We Going to Get There? Paul M. Salmon, Michael Regan and Ian Johnston, Monash University Accident Research Centre	143
PART 3	NORMAL OPERATIONS MONITORING AND SURVEILLANCE TOOLS	157
14	Performance and Cognition in Dynamic Environments: The Development of a New Tool to Assist Practitioners Jemma M. Harris and Mark W. Wiggins, University of Western Sydney, Scott Taylor, Eastern Australia Airlines Matthew J.W. Thomas, University of South Australia	159
15	Error Management Training: Identification of Core Cognitive and Interpersonal Skill Dimensions Matthew J.W. Thomas and Renée M. Petrilli, University of South Australia	169
16	Confidential Observations of Rail Safety (CORS): An Adaptation of Line Operations Safety Audit (LOSA) Allison McDonald and Brett Garrigan, Queensland Rail Lisette Kanse, University of Queensland	179

Contents vii

17	Human Factors in Air Traffic Control: An Integrated Approach Christine C. Boag-Hodgson, Airservices Australia	189
PART 4	THE MODALITY OF HUMAN FACTORS: EXPLORING THE MANAGEMENT OF HUMAN ERROR	197
18	Human Factors at Railway Level Crossings: Key Issues and Target Road User Groups Jeremy Davey, Nadja Ibrahim and Angela Wallace, Queensland University of Technology	199
19	Attitudes to Safety and Teamwork in the Operating Theatre, and the Effects of a Program of Simulation-Based Team Training Brendan Flanagan, Michele Joseph and Michael Bujor, Southern Health Simulation and Skills Centre, Victoria Stuart Marshall, The Alfred Hospital	211
20	Human Factors and the QFI: Developing Tools through Experience Boyd Falconer, University of New South Wales	221
21	Advanced Driver Assistance Systems and Road Safety: The Human Factor Michael A. Regan and Kristie L. Young, Monash University Accident Research Centre	233
22	Recovery of Situational Awareness Using Operant Conditioning Techniques Peter N. Rosenweg, Psyfactors Pty Ltd	245
23	Effects of Flight Duty and Sleep on the Decision-Making of Commercial Airline Pilots Renée M. Petrilli, Matthew J.W. Thomas, Nicole Lamon, Drew Dawson and Gregory D. Roach, University of South Australia	259
24	Medical Team Resource Management and Error Prevention Training David G. Newman, Flight Medicine Systems Pty Ltd	271
25	Driver Distraction: Review of the Literature and Suggestions for Countermeasure Development Kristie L. Young and Michael A. Regan, Monash University Accident Research Centre	279

viii	Multimodal Safety Management and Human Factors	
26	Assessing and Managing Human Factors Risks – Practical Examples in the Australian Rail Context Julia Clancy, Lloyd's Register	291
27	Anaesthetic Registrars' Stress Mediators in a Simulated Critical Incident Kate Fraser, Matthew J.W. Thomas and Renée Petrilli, University of South Australia	301
28	Trying Before Buying: Human Factors Evaluations of New Medical Technology J.M. Davies, J.K. Caird and S. Chisholm University of Calgary, Canada	315
Index		325

List of Figures

3.1	The Reason Model (A)	19
3.2	The Reason Model (B)	20
3.3	Sequence of events diagram	21
3.4	Investigation process from TSB manuals	22
3.5	DC-10 Chicago sequence of events example	24
3.6	Swissair 111 sequence of events example	25
3.7	Medical incident sequence of events	26
3.8	B767 Gimli fuel exhaustion sequence of events example	27
3.9	Air Transat A330 Azores fuel exhaustion sequence of events example	28
3.10	A slight revision of the Reason Model	29
4.1	The Patient Safety Framework	35
7.1	Manufacturer's boxes of sodium chloride (NaCl) and potassium chloride (KCl), in which the bottles of NaCl and KCl were transported and stored	63
7.2	Manufacturer's vials of sodium chloride (NaCl) and potassium chloride (KCl)	63
7.3	The Calgary Health Region's safety framework	64
8.1	Potential data sources for accidents and incidents in general aviation (for operations covered in the BTRE definition of GA)	77
9.1	Undesirable effects in the Ansett Dash 8 accident	85
9.2	Connections between undercarriage latch design and potential to strike terrain	86
9.3	Financial stress and emergency training	87
9.4	Lack of continuation training – approach procedure	89
9.5	Maintenance aspects	89
9.6	Undercarriage failures	90
9.7	Absence of safety manager	91
9.8	Shortness of GPWS warning	92

9.9	Ansett Dash 8 current reality tree	93
9.10	Undesirable effects at the CAA	94
9.11	Absence of mindfulness at the CAA	95
9.12	Airline financial status effects	96
9.13	Current reality tree: the ability of the CAA to avert the Ansett accident	97
9.14	Future reality tree: safety manager functions	99
9.15	The Ansett future reality tree	100
9.16	Conflict resolution diagram from CAA CRT	102
9.17	From sufficient resources to design of safety oversight regime	103
9.18	Future reality tree for the CAA	104
12.1	ICAM model of incident causation	133
12.2	ICAM analysis chart	138
13.1	The Swiss cheese model of error and accident causation	145
13.2	Prototype model of road user error and contributing conditions	148
13.3	A framework for an error tolerant road transport system	150
13.4	Data requirements for Phase four pilot study	152
13.5	Proposed pilot study methodology	153
15.1	A model of error management	175
17.1	TAAATS console display	192
20.1	Typical deficiencies among RAAF student pilots	224
20.2	Braithwaite's (2001) survey item designed to measure the influence of hierarchy upon aircrew	225
20.3	Response from RAAF aircrew to Braithwaite's survey item	226
20.4	Tools for maximizing learning development	228
22.1	Cognitive failure and unsafe behaviour	247
22.2	The situational safety awareness model	249
23.1	Mean times (in mins) for crews to finalize their decision in the high-sleep and low-sleep groups	267
23.2	Mean times (in mins) for crews to take positive action towards their decision in the high-sleep and low-sleep groups	268

List of Figures

хi

27.1	Experimental protocol with three night shifts or three days' leave prior to simulator session	305
27.2	Mean RMSSD (±SEM) for baseline and 10 minutes prior to and post onset of the critical event for the rested condition and	
	non-rested condition	307

List of Tables

4.1	increase in population in the Calgary Health Region,	
	2001–2005	32
4.2	Dimensions of quality of care	34
4.3	The '4Ps' of safety management	36
6.1	Aircraft capacity growth	53
6.2	Growth in capacity to JetStar destinations	53
7.1	Levels of harm	68
10.1	Solo general and navigation hours, 1947-present	108
10.2	Minimum <i>ab initio</i> instructional hours to be a Chief Flying Instructor	108
11.1	Pilot human factors accidents	115
11.2	Wire strikes	116
11.3	Failed to get/stay airborne	117
11.4	Landing accidents	118
11.5	Controlled flight into terrain	119
11.6	Loss of control/stall in procedure turn	120
11.7	Fuel exhaustion	120
11.8	Taxying accidents	121
11.9	Failure to re-configure aircraft correctly pre-flight	121
11.10	Aerial agriculture accidents 1985-1993	124
12.1	ICAM Organizational Factor Types	134
12.3	Case study and recommended actions	140
14.1	Cognitive task analysis interview questions	163
14.2	Mean number of tasks described as a function of stage of flight	163
14.3	Mean cognitive complexity scores as function of stage of flight	164
14.4	Mean perceived difficulty scores as function of stage of flight	164
16.1	A comparison of LOSA data (Klinect, Wilhelm and Helmreich, 1999) and CORS data	185

Multimodal Safety	Management ar	nd Human	Factors
-------------------	---------------	----------	---------

xiv

19.1	Post course postal evaluation $(N = 18)$	214
19.2	Preliminary data on the effect of the CRM training program on teamwork and safety climates	214
19.3	Most frequent recommendations for improved safety in the OR	215
20.1	Civilian and RAAF pilot training comparison	223
20.2	A taxonomy of visualization in flying training	230
22.1	SSA test scale results for Group 1 and Group 2 participants	253
22.2	Report of use and retention of the SA recovery skill	254
23.1	Statistical analyses of the decision variables with duty as the independent variable.	265
23.2	Statistical analyses of the decision variables with sleep as the independent variable	266
27.1	Summary of attitudes to stress and fatigue (% response)	308