Contents

Preface xi
Editors xv
Contributors xvii

Section 1

1. **Introduction to the Requirements of Railway RAM, Safety, and Related General Management** 3
   Qamar Mahboob, Enrico Zio, and Pierre Dersin

2. **Basic Methods for RAM Analysis and Decision Making** 13
   Andreas Joanni, Qamar Mahboob, and Enrico Zio

3. **Advanced Methods for RAM Analysis and Decision Making** 39
   Andreas Joanni, Qamar Mahboob, and Enrico Zio

4. **Safety Integrity Concept** 63
   Holger Schult

5. **SIL Apportionment and SIL Allocation** 69
   Hendrik Schäbe

6. **Prognostics and Health Management in Railways** 79
   Pierre Dersin, Allegra Alessi, Olga Fink, Benjamin Lamoureux, and Mehdi Brahimi

7. **Human Factors and Their Application in Railways** 99
   Birgit Milius

8. **Individual Risk, Collective Risk, and F–N Curves for Railway Risk Acceptance** ... 119
   Jens Braband and Hendrik Schäbe

9. **Practical Demonstrations of Reliability Growth in Railways** 139
   Hendrik Schäbe

10. **Methods for RAM Demonstration in Railway Projects** 147
    Pierre Dersin and Cristian Maiorano

11. **Guide for Preparing Comprehensive and Complete Case for Safety for Complex Railway Products and Projects** 167
    Ruben Zocco

12. **Reliability Demonstration Tests: Decision Rules and Associated Risks** 185
    Pierre Dersin and Cristian Maiorano

13. **Hazard Log: Structure and Management in Complex Projects** 199
Rohan Sharma

14. **Life Cycle Cost in Railway Asset Management with Example Applications** 213
Simone Finkeldei and Thomas Grossenbacher

15. **System Assurance for Railway Mechanical Signaling Products** 233
Kyoumars Bahrami

16. **Software Reliability in RAMS Management** 247
Vidhyashree Nagaraju and Lance Fiondella

17. **Applications of Formal Methods, Modeling, and Testing Strategies for Safe Software Development** 275
Alessandro Fantechi, Alessio Ferrari, and Stefania Gnesi

18. **Practical Statistics and Demonstrations of RAMS in Projects** 297
Joerg Schuette

19. **Proven in Use for Software: Assigning an SIL Based on Statistics** 337
Jens Braband, Heinz Gall, and Hendrik Schäbe

20. **Target Reliability for New and Existing Railway Civil Engineering Structures** 351
Miroslav Sykora, Dimitris Diamantidis, Milan Holicky, and Karel Jung

Section 2

21. **Methodology and Application of RAM Management along the Railway Rolling Stock Life Cycle** 379
Olga Fink and Simone Finkeldei

22. **IT Security Framework for Safe Railway Automation** 393
Jens Braband

23. **Reliability Modeling and Analysis of European Train Control System** 403
Yiliu Liu and Lei Jiang

24. **Designing for RAM in Railway Systems: An Application to the Railway Signaling Subsystem** 425
Pierre Dersin, Alban Péronne, and René Valenzuela

25. **Fuzzy Reasoning Approach and Fuzzy Analytical Hierarchy Process for Expert Judgment Capture and Process in Risk Analysis** 441
Min An and Yao Chen

26. **Independent Safety Assessment Process and Methodology** 475
Peter Wigger

27. **Application of the Interface and Functional Failure Mode Effects and Criticality Analysis (IFF-MECA) for RAM and Safety Assessment of Rail Electrification** 487
Qamar Mahboob

28. **RAMS as Integrated Part of the Engineering Process and the Application for Railway Rolling Stock** 503
Georg Edlbacher and Simone Finkeldei

29. **Safety and Security Assurance in Complex Technological Train Control System** 513
Datian Zhou, Ali Hessami, and Xiaofei Yao

30. **Application of Risk Analysis Methods for Railway Level Crossing Problems** 551
Eric J. Schöne and Qamar Mahboob

31. **Human Reliability and RAMS Management** 571
Malcolm Terry Guy Harris

32. **Generic Approval Process for Public Transport Systems** 587
Peter Wigger

33. **Importance of Safety Culture for RAMS Management** 599
Malcolm Terry Guy Harris

34. **Railway Security Policy and Administration in the United States: Reacting to the Terrorist Threat after September 11, 2001** 617
Jeremy F. Plant, Gary A. Gordon, and Richard R. Young

35. **Introduction to IT Transformation of Safety and Risk Management Systems** 631
Coen van Gulijk, Miguel Figueres-Esteban, Peter Hughes, and Andrei Loukianov

36. **Formal Reliability Analysis of Railway Systems Using Theorem Proving Technique** 651
Waqar Ahmad, Osman Hasan, and Sofiène Tahar

37. **Roles and Responsibilities for New Built, Extension, or Modernization of a Public Transport System: A Walk through the Life Cycle** 669
Peter Wigger

38. **Holistic View on the Charm and Challenge of CENELEC Standards for Railway Signaling** 689
Attilio Ciancabilla and Stephan Griebel

Appendix 697

Index 715