

## A Resilience Engineering Approach For Sustainable Safety

Patient safety is a core issue in healthcare today with a large number of patient deaths and other adverse events associated with the care-giving process. The traditional approaches to safety which focus on finding and eliminating the "root-causes" of failure have only been minimally effective. Resilience Engineering (RE) is a new field that marks a paradigm shift in the safety sciences. Instead of looking at what goes wrong, the focus of RE is on understanding and supporting what goes right. In other words, the emphasis is on unraveling and enhancing the sources of resilience in a system. The overall objective of this research was to apply the principles of RE toward improving patient safety and quality of healthcare. The specific aims were threefold: (i) to interview healthcare workers about how they ensure patient safety in challenging situations; (ii) to analyze the data and cross-validate findings with the existing conceptual framework of RE; and (iii) to create a tool for employees across the healthcare organization to report examples of resilience from their own practice, and perform a preliminary evaluation of the tool. A multi-phase research was planned to achieve these objectives. In the first phase, an interview guide was created based on traditional critical incident interviewing techniques. The guide was adapted to elicit resilience-related information from frontline and managerial staff in health care, particularly in terms of achieving patient safety. Eighteen interviews were conducted with clinicians, nurses and safety administrators from a large, multi-hospital medical system. In the second phase, the interviews were analyzed and various factors pertinent to patient safety were extracted. These factors were aligned with the essential capabilities of a resilient system -- learning, responding, anticipating and monitoring. Results indicated that the capabilities manifested in different ways across different system levels -- from the individual practitioner to teams to the senior management level. A Resilience Mapping Framework (RMF) was developed to systematically map resilience against specific issues across the organization. In the third phase, the analysis of the interviews was used to develop a Resilience Engineering Tool to Improve Patient Safety (RETIPS) that can be implemented organization-wide for reporting and analysis of resilience-based cases. The research has several implications, both in terms of developing the theoretical framework of RE as well for the improvement of patient safety. RETIPS can be used by hospitals to learn about the resilience capabilities that emerge from the frontlines of care and inform policy-making. The RMF can be used by the hospital's safety administration to identify hidden risks as well as opportunities to improve resilience and safety.

The oil and gas industry is going through a major technological shift. This is particularly true of the Norwegian continental shelf where new work processes are being implemented based on digital infrastructure and information technology. The term Integrated Operations (IO) has been applied to this set of new processes. It is defined by the Centre for Integrated Operations in the Petroleum Industry as 'work processes and technology to make smarter decisions and better execution, enabled by ubiquitous real time data, collaborative techniques and access to multiple expertise'. It's claimed that IO is efficient, optimises exploration, reduces costs and improves safety performance. However, the picture is not as clear-cut as it may appear. On the one hand, the new work processes do not prevent major accidents: IO-related factors have been identified in recent events such as the Deepwater Horizon catastrophe. On the other hand, IO technology provides improved decision-making support (such as access to real-time data and expertise), which can reduce human and material losses and damage to the environment. Given these very different properties, it's vital that the industry has a detailed understanding of the benefits and drawbacks of IO, which this book sets out to do from a multidisciplinary point of view. It analyses Integrated Operations from the angles of statistics, management science, human factors and resilience engineering. These varied disciplines provide a multifaceted understanding of IO that better informs risk assessment practices, as well as explaining new techniques and methods and provides state-of-the-art guidance to risk assessment practitioners working in the oil and gas industry.

In the resilience engineering approach to safety, failures and successes are seen as two different outcomes of the same underlying process, namely how people and organizations cope with complex, underspecified and therefore partly unpredictable work environments. Therefore safety can no longer be ensured by constraining performance and eliminating risks. Instead, it is necessary to actively manage how people and organizations adjust what they do to meet the current conditions of the workplace, by trading off efficiency and thoroughness and by making sacrificing decisions. The Ashgate Studies in Resilience Engineering series promulgates new methods, principles and experiences that can complement established safety management approaches, providing invaluable insights and guidance for practitioners and researchers alike in all safety-critical domains. While the Studies pertain to all complex systems they are of particular interest to high hazard sectors such as aviation, ground transportation, the military, energy production and distribution, and healthcare. Published periodically within this series will be edited volumes titled Resilience Engineering Perspectives. The first volume, Remaining Sensitive to the Possibility of Failure, presents a collection of 20 chapters from international experts. This collection deals with important issues such as measurements and models, the use of procedures to ensure safety, the relation between resilience and robustness, safety management, and the use of risk analysis. The final six chapters utilise the report from a serious medical accident to illustrate more concretely how resilience engineering can make a difference, both to the understanding of how accidents happen and to what an organisation can do to become more resilient. Resilience has become an important topic on the safety research agenda and in organizational practice. Most empirical work on resilience has been descriptive, identifying characteristics of work and organizing activity which allow organizations to cope with unexpected situations. Fewer studies have developed testable models and theories that can be used to support interventions aiming to increase resilience and improve safety. In addition, the absent integration of different system levels from individuals, teams, organizations, regulatory bodies, and policy level in theory and practice imply that mechanisms through which resilience is linked across complex systems are not yet well understood. Scientific efforts have been made to develop constructs and models that present relationships; however, these cannot be characterized as sufficient for theory building. There is a need for taking a broader look at resilience practices as a foundation for developing a theoretical framework that can help improve safety in complex systems. This book does not advocate for one definition or one field of research when talking about resilience: it does not assume that the use of resilience concepts is necessarily positive for safety. We encourage a broad approach, seeking inspiration across different scientific and practical domains for the purpose of further developing resilience at a theoretical and an operational level of relevance for different high-risk industries. The aim of the book is twofold: 1. To explore different approaches for operationalization of resilience across scientific disciplines and system levels. 2. To create a theoretical foundation for a resilience framework across scientific disciplines and system levels. By presenting chapters from leading international authors representing different research disciplines and practical fields we develop suggestions and inspiration for the research community and practitioners in high-risk industries. This book is Open Access under a CC-BY licence.; Explores different approaches for operationalization of resilience across scientific disciplines and system levels Creates a theoretical foundation for a resilience framework across scientific disciplines and system levels Develops suggestions and inspiration for the research community and practitioners in high-risk industries Presents chapters from leading international authors representing different research disciplines and practical fields This work was published by Saint Philip Street Press pursuant to a Creative Commons license permitting commercial use. All rights not granted by the work's license are retained by the author or authors.

System Resiliency in Practice

Exploring Patient Safety in Home Healthcare

Fundamentals and Applications

A Resilience Engineering Perspective

Preparation and Restoration

Toward Social-Scientific Literacy and Engineering Resilience

Resilience Engineering for Urban Tunnels

**Safety has traditionally been defined as a condition where the number of adverse outcomes was as low as possible (Safety-I). From a Safety-I perspective, the purpose of safety management is to make sure that the number of accidents and incidents is kept as low as possible, or as low as is reasonably practicable. This means that safety management must start from the manifestations of the absence of safety and that - paradoxically - safety is measured by counting the number of cases where it fails rather than by the number of cases where it succeeds. This unavoidably leads to a reactive approach based on responding to what goes wrong or what is identified as a risk - as something that could go wrong. Focusing on what goes right, rather than on what goes wrong, changes the definition of safety from 'avoiding that something goes wrong' to 'ensuring that everything goes right'. More precisely, Safety-II is the ability to succeed under varying conditions, so that the number of intended and acceptable outcomes is as high as possible. From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management cannot only be reactive, it must also be proactive. But it must be proactive with regard to how actions succeed, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does. This book analyses and explains the principles behind both approaches and uses this to consider the past and future of safety management practices. The analysis makes use of common examples and cases from domains such as aviation, nuclear power production, process management and health care. The final chapters explain the theoretical and practical consequences of the new perspective on the level of day-to-day operations as well as on the level of strategic management (safety culture). Safety-I and Safety-II is written for all professionals responsible for their organisation's safety, from strategic planning on the executive level to day-to-day operations in the field. It presents the detailed and tested arguments for a transformation from protective to productive safety management.**

**Safety-I is defined as the freedom from unacceptable harm. The purpose of traditional safety management is therefore to find ways to ensure this 'freedom'. But as socio-technical systems steadily have become larger and less tractable, this has become harder to do. Resilience engineering pointed out from the very beginning that resilient performance - an organisation's ability to function as required under expected and unexpected conditions alike – required more than the prevention of incidents and accidents. This developed into a new interpretation of safety (Safety-II) and consequently a new form of safety management. Safety-II changes safety management from protective safety and a focus on how things can go wrong, to productive safety and a focus on how things can and do go well. For Safety-II, the aim is not just the elimination of hazards and the prevention of failures and malfunctions but also how best to develop an organisation's potentials for resilient performance – the way it responds, monitors, learns, and anticipates. That requires models and methods that go beyond the Safety-I toolbox. This book introduces a comprehensive approach for the management of Safety-II, called the Resilience Assessment Grid (RAG). It explains the principles of the RAG and how it can be used to develop the resilience potentials. The RAG provides four sets of diagnostic and formative questions that can be tailored to any organisation. The questions are based on the principles of resilience engineering and backed by practical experience from several domains. Safety-II in Practice is for both the safety professional and academic reader. For the professional, it presents a workable method (RAG) for the management of Safety-II, with a proven track record. For academic and student readers, the book is a concise and practical presentation of resilience engineering.**

**Resilience Engineering (RE) studies have successfully identified and described many instances of resilient performance in high hazard sectors as well as in the far more frequent cases where people and organisations cope with the uncertainties of daily operations. Since RE was first described in 2006, a steady accumulation of insights and efforts have provided the basis for practical tools and methods. This development has been documented by a series of texts in the Resilience Engineering Perspectives series as well as by a growing number of papers and reports. This book encapsulates the essential practical lessons learned from the use of Resilience Engineering (RE) for over ten years. The main contents are a series of chapters written by those who have been instrumental in these applications. To increase the value for the reader, each chapter will include: rationale for the overall approach; data sought and reason(s) for choosing; data sources used, data analyses performed, and how recommendations were made and turned into practice. Serving as a reference for practitioners who want to analyse, support, and manage resilient performance, this book also advances research into RE by inquiring why work goes well in unpredictable environments, to improve work performance, or compensate for deficiencies.**

**This book presents the select proceedings of the Virtual Conference on Disaster Risk Reduction (VCDRR 2021). It emphasizes on the role of civil engineering for a disaster resilient society. Various topics covered in this book are risk assessment, prevention, mitigation, preparedness and response, early warning system, hazard mapping, engineering innovations for hazard mitigation, and safe design of structures. This book is a comprehensive volume on disaster risk reduction (DRR) and its management for a sustainable built environment. This book will be useful for the students, researchers, policy makers and professionals working in the area of civil engineering, especially disaster management.**

**Resilient Health Care**

**Oil and Gas, Technology and Humans**

**8-10 November, 2006, Antibes-Juan-les-Pins, France**

**Chaos Engineering**

**Resilience Engineering Perspectives**

**FRAM - the Functional Resonance Analysis Method**

**Proceedings of the Third Resilience Engineering Symposium**

Accident investigation and risk assessment have for decades focused on the human factor, particularly 'human error'. This bias towards performance failures leads to a neglect of normal performance. It assumes that failures and successes have different origins so there is little to be gained from studying them together. Erik Hollnagel believes this assumption is false and that safety cannot be attained only by eliminating risks and failures. The alternative is to understand why things go right and to amplify that. The ETTO Principle looks at the common trait of people at work to adjust what they do to match the conditions. It proposes that this efficiency-thoroughness trade-off (ETTO) is normal. While in some cases the adjustments may lead to adverse outcomes, these are due to the same processes that produce successes.

Engineers are always interested in the worst-case scenario. One of the most important and challenging missions of structural engineers may be to narrow the range of unexpected incidents in building structural design. Redundancy, robustness and resilience play an important role in such circumstances. Improving the Earthquake Resilience of Buildings: The worst case approach discusses the importance of worst-scenario approach for improved earthquake resilience of buildings and nuclear reactor facilities. Improving the Earthquake Resilience of Buildings: The worst case approach consists of two parts. The first part deals with the characterization and modeling of worst or critical ground motions on inelastic structures and the related worst-case scenario in the structural design of ordinary simple building structures. The second part of the book focuses on investigating the worst-case scenario for passively controlled and base-isolated buildings. This allows for detailed consideration of a range of topics including: A consideration of damage of building structures in the critical excitation method for improved building-earthquake resilience, A consideration of uncertainties of structural parameters in structural control and base-isolation for improved building-earthquake resilience, and New insights in structural design of super high-rise buildings under long-period ground motions. Improving the Earthquake Resilience of Buildings: The worst case approach is a valuable resource for researchers and engineers interested in learning and applying the worst-case scenario approach in the seismic-resistant design for more resilient structures.

No person or place is immune from disasters or disaster-related losses. Infectious disease outbreaks, acts of terrorism, social unrest, or financial disasters in addition to natural hazards can all lead to large-scale consequences for the nation and its communities. Communities and the nation thus face difficult fiscal, social, cultural, and environmental choices about the best ways to ensure basic security and quality of life against hazards, deliberate attacks, and disasters. Beyond the unquantifiable costs of injury and loss of life from disasters, statistics for 2011 alone indicate economic damages from natural disasters in the United States exceeded \$55 billion, with 14 events costing more than a billion dollars in damages each. One way to reduce the impacts of disasters on the nation and its communities is to invest in enhancing resilience--the ability to prepare and plan for, absorb, recover from and more successfully adapt to adverse events. Disaster Resilience: A National Imperative addresses the broad issue of increasing the nation's resilience to disasters. This book defines "national resilience", describes the state of knowledge about resilience to hazards and disasters, and frames the main issues related to increasing resilience in the United States. It also provide goals, baseline conditions, or performance metrics for national resilience and outlines additional information, data, gaps, and/or obstacles that need to be addressed to increase the nation's resilience to disasters. Additionally, the book's authoring committee makes recommendations about the necessary approaches to elevate national resilience to disasters in the United States. Enhanced resilience allows better anticipation of disasters and better planning to reduce disaster losses--rather than waiting for an event to occur and paying for it afterward. Disaster Resilience confronts the topic of how to increase the nation's resilience to disasters through a vision of the characteristics of a resilient nation in the year 2030. Increasing disaster resilience is an imperative that requires the collective will of the nation and its communities. Although disasters will continue to occur, actions that move the nation from reactive approaches to disasters to a proactive stance where communities actively engage in enhancing resilience will reduce many of the broad societal and economic burdens that disasters can cause.

How are today's 'hearts and minds' programs linked to a late-19th century definition of human factors as people's moral and mental deficits? What do Heinrich's 'unsafe acts' from the 1930's have in common with the Swiss cheese model of the early 1990's? Why was the reinvention of human factors in the 1940's such an important event in the development of safety thinking? What makes many of our current systems so complex and impervious to Tayloristic safety interventions? 'Foundations of Safety Science' covers the origins of major schools of safety thinking, and traces the heritage and interlinkages of the ideas that make up safety science today. Features Offers a comprehensive overview of the theoretical foundations of safety science Provides balanced treatment of approaches since the early 20th century, showing interlinkages and cross-connections Includes an overview and key points at the beginning of each chapter and study questions at the end to support teaching use Uses an accessible style, using technical language where necessary Concentrates on the philosophical and historical traditions and assumptions that underlie all safety approaches

Resilience Engineering Perspectives, Volume 1

Selected Papers of the 5th ENRI International Workshop on ATM/CNS (EIWAC2017)

Air Traffic Management and Systems III

A Resilience Engineering Approach to Safety Excellence in the Maintenance of Oil and Gas Assets

Improving the Earthquake Resilience of Buildings

Proceedings of the Second Resilience Engineering Symposium

Safety has traditionally been defined as a condition where the number of adverse outcomes was as low as possible (Safety-I). From a Safety-I perspective, the purpose of safety management is to make sure that the number of accidents and incidents is kept as low as possible, or as low as is reasonably practicable. This means that safety management must start from the manifestations of the absence of safety and that - paradoxically - safety is measured by counting the number of cases where it fails rather than by the number of cases where it succeeds. This unavoidably leads to a reactive approach based on

responding to what goes wrong or what is identified as a risk - as something that could go wrong. Focusing on what goes right, rather than on what goes wrong, changes the definition of safety from 'avoiding that something goes wrong' to 'ensuring that everything goes right'. More precisely, Safety-II is the ability to succeed under varying conditions, so that the number of intended and acceptable outcomes is as high as possible. From a Safety-II perspective, the purpose of safety management is to ensure that as much as possible goes right, in the sense that everyday work achieves its objectives. This means that safety is managed by what it achieves (successes, things that go right), and that likewise it is measured by counting the number of cases where things go right. In order to do this, safety management cannot only be reactive, it must also be proactive. But it must be proactive with regard to how actions succeed, to everyday acceptable performance, rather than with regard to how they can fail, as traditional risk analysis does. This book analyses and explains the principles behind both approaches and uses this to consider the past and future of safety management practices. The analysis makes use of common examples and cases from domains such as aviation, nuclear power production, process management and health care. The final chapters explain the theoret

Cloud services are just as susceptible to network outages as any other platform. This concise book shows you how to prepare for potentially devastating interruptions by building your own resilient and reliable applications in the public cloud. Guided by engineers from 9apps—an independent provider of Amazon Web Services and Eucalyptus cloud solutions—you'll learn how to combine AWS with open source tools such as PostgreSQL, MongoDB, and Redis. This isn't a book on theory. With detailed examples, sample scripts, and solid advice, software engineers with operations experience will learn specific techniques that 9apps routinely uses in its cloud infrastructures. Build cloud applications with the "rip, mix, and burn" approach Get a crash course on Amazon Web Services Learn the top ten tips for surviving outages in the cloud Use elasticsearch to build a dependable NoSQL data store Combine AWS and PostgreSQL to build an RDBMS that scales well Create a highly available document database with MongoDB Replica Set and SimpleDB Augment Redis with AWS to provide backup/restore, failover, and monitoring capabilities Work with CloudFront and Route 53 to safeguard global content delivery Properly performing health care systems require concepts and methods that match their complexity. Resilience engineering provides that capability. It focuses on a system's overall ability to sustain required operations under both expected and unexpected conditions rather than on individual features or qualities. This book contains contributions from international experts in health care, organisational studies and patient safety, as well as resilience engineering. Whereas current safety approaches primarily aim to reduce the number of things that go wrong, Resilient Health Care aims to increase the number of things that go right.

Preparation and Restoration addresses issues such as the nature of resilience; the similarities and differences between resilience and traditional ideas of system performance; how systems cope with varying demands and sometimes succeed and sometimes fail; how an organization's ways of preparing before critical events can enable or impede restoration; the trade-offs that are needed for systems to operate and survive; instances of brittle or resilient systems; how work practices affect resilience; the relationship between resilience and safety; and what improves or erodes resilience.

Safety and Reliability – Safe Societies in a Changing World

Resilience Engineering in Practice

Concepts and Precepts

The Past and Future of Safety Management

Remaining Sensitive to the Possibility of Failure

A System Engineering Approach to Disaster Resilience

A Handbook for the Practical Use of the Method

*Preparation and Restoration is the second volume of Resilience Engineering Perspectives within the Ashgate Studies in Resilience Engineering series. In four sections, it broadens participation of the field to include policy and organization studies, and articulates aspects of resilience beyond initial definitions: – Policy and Organization explores public policy and organizational aspects of resilience and how they aid or inhibit preparation and restoration – Models and Measures addresses thoughts on ways to measure resilience and model systems to detect desirable, and undesirable, results – Elements and Traits examines features of systems and how they affect the ability to prepare for and recover from significant challenges – Applications and Implications examines how resilience plays out in the living laboratory of real-world operations. Preparation and Restoration addresses issues such as the nature of resilience; the similarities and differences between resilience and traditional ideas of system performance; how systems cope with varying demands and sometimes succeed and sometimes fail; how an organization's ways of preparing before critical events can enable or impede restoration; the trade-offs that are needed for systems to operate and survive; instances of brittle or resilient systems; how work practices affect resilience; the relationship between resilience and safety; and what improves or erodes resilience. This volume is valuable reading for those who create and operate systems that must not only survive, but thrive, in the face of challenge.*

*This volume describes how safety can change from being protective to being productive, thereby improving the resilience of the system. This is the fifth book published within the Ashgate Studies in Resilience Engineering series. The first introduced resilience engineering broadly. The second and third established the research foundation for the real-world applications that then were described in the fourth volume: Resilience Engineering in Practice. The current volume continues this development by focusing on the role of resilience in the development of solutions.*

*This book explores a number of important issues in the area of occupational safety and hygiene. Presenting both research and best practices for the evaluation of occupational risk, safety and health in various types of industry, it particularly focuses on occupational safety in automated environments, innovative management systems and occupational safety in a global context. The different chapters examine the perspectives of all those involved, such as managers, workers and OSH professionals. Based on selected contributions presented at the 16th International Symposium on Occupational Safety and Hygiene (SHO 2020), held on 6–7 April, 2020, in Porto, Portugal, the book serves as a timely reference guide and source of inspiration to OSH researchers, practitioners and organizations operating in a global context.*

*IRP 2 contains selected papers from the 2016 International Workshop on Resiliency of Urban Tunnels, which address tunnels as a part of the complex urban infrastructure system and provide a basis for the development of a dynamic risk control and resilient design approach to urban tunnels.*

*Reflections on the Fukushima Daiichi Nuclear Accident*

*A Century of Understanding Accidents and Disasters*

*Why Things That Go Right Sometimes Go Wrong*

*A Resilience Engineering Approach to Improving Patient Safety and Quality of Healthcare*

*Resilience Engineering Perspectives: Remaining sensitive to the possibility of failure*

*Exploring Resilience*

*Risk Analysis and Management: Engineering Resilience*

This book illustrates how the safety science of Resilience Engineering can help to gain a better understanding of what the financial services system is and how to improve governance and control of financial services systems by leveraging some of its key concepts. Resilience is the intrinsic ability of a system to adjust its

functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.

Resilience Engineering Concepts and Precepts CRC Press

A comprehensive resource to sustainability and its application to the environmental, industrial, agricultural and food security sectors Sustainability fills a gap in the literature in order to provide an important guide to the fundamental knowledge and practical applications of sustainability in a wide variety of areas. The authors – noted experts who represent a number of sustainability fields – bring together in one comprehensive volume the broad range of topics including basic concepts, impact assessment, environmental and the socio-economic aspects of sustainability. In addition, the book covers applications of sustainability in environmental, industrial, agricultural and food security, as well as carbon cycle and infrastructural aspects. Sustainability addresses the challenges the global community is facing due to population growth, depletion of non-renewable resources of energy, environmental degradation, poverty, excessive generation of wastes and more. Throughout the book the authors discuss the economics, ecological, social, technological and systems perspectives of sustainability. This important resource: • Explores the fundamentals as well as the key concepts of sustainability; • Covers basic concepts, impact assessment, environmental and socio-economic aspects, applications of sustainability in environmental, industrial, agricultural and food security, carbon cycle and infrastructural aspects; • Argues the essentiality of sustainability in ensuring the propitious future of earth systems; and • Authored by experts from a range of various fields related to sustainability. Written for researchers and scientists, students and academics, Sustainability: Fundamentals and Applications is a comprehensive book that covers the basic knowledge of the topic combined with practical applications.

Safety and Reliability – Safe Societies in a Changing World collects the papers presented at the 28th European Safety and Reliability Conference, ESREL 2018 in Trondheim, Norway, June 17-21, 2018. The contributions cover a wide range of methodologies and application areas for safety and reliability that contribute to safe societies in a changing world. These methodologies and applications include: - foundations of risk and reliability assessment and management - mathematical methods in reliability and safety - risk assessment - risk management - system reliability - uncertainty analysis - digitalization and big data - prognostics and system health management - occupational safety - accident and incident modeling - maintenance modeling and applications - simulation for safety and reliability analysis - dynamic risk and barrier management - organizational factors and safety culture - human factors and human reliability - resilience engineering - structural reliability - natural hazards - security - economic analysis in risk management Safety and Reliability – Safe Societies in a Changing World will be invaluable to academics and professionals working in a wide range of industrial and governmental sectors: offshore oil and gas, nuclear engineering, aeronautics and aerospace, marine transport and engineering, railways, road transport, automotive engineering, civil engineering, critical infrastructures, electrical and electronic engineering, energy production and distribution, environmental engineering, information technology and telecommunications, insurance and finance, manufacturing, marine transport, mechanical engineering, security and protection, and policy making.

A Resilience Engineering Approach to Managing Safety Management Systems (SMS) in the Transport Sector

The worst case approach

Becoming Resilient

Assessing the Human Factors of Technological Change

Sustainability

A Resilience Engineering Approach

Occupational and Environmental Safety and Health II

The book introduces basic risk concepts and then goes on to discuss risk management and analysis processes and steps. The main emphasis is on methods that fulfill the requirements of one or several risk management steps.

The focus is on risk analysis methods including statistical-empirical analyses, probabilistic and parametrized models, engineering approaches and simulative methods, e.g. for fragment and blast propagation or hazard density computation. Risk management is essential for improving all resilience management steps: preparation, prevention, protection, response and recovery. The methods investigate types of event and scenario, as well as frequency, exposure, avoidance, hazard propagation, damage and risks of events. Further methods are presented for context assessment, risk visualization, communication, comparison and assessment as well as selecting mitigation measures. The processes and methods are demonstrated using detailed results and overviews of security research projects, in particular in the applications domains transport, aviation, airport security, explosive threats and urban security and safety. Topics include: sufficient control of emerging and novel hazards and risks, occupational safety, identification of minimum (functional) safety requirements, engineering methods for countering malevolent or terrorist events, security research challenges, interdisciplinary approaches to risk control and management, risk-based change and improvement management, and support of rational decision-making. The book addresses advanced bachelor students, master and doctoral students as well as scientists, researchers and developers in academia, industry, small and medium enterprises working in the emerging field of security and safety engineering.

This is the fifth book published within the Ashgate Studies in Resilience Engineering series. The first volume introduced resilience engineering broadly. The second and third volumes established the research foundation for the real-world applications that then were described in the fourth volume: Resilience Engineering in Practice. The current volume continues this development by focusing on the role of resilience in the development of solutions. Since its inception, the development of resilience engineering as a concept and a field of practice has insisted on expanding the scope from a preoccupation with failure to include also the acceptable everyday functioning of a system or an organisation. The preoccupation with failures and adverse outcomes focuses on situations where something goes wrong and the tries to keep the number of such events and their (adverse) outcomes as low as possible. The aim of resilience engineering and of this volume is to describe how safety can change from being protective to become productive and increase the number of things that go right by improving the resilience of the system.

This book focuses on nuclear engineering education in the post-Fukushima era. It was edited by the organizers of the summer school held in August 2011 in University of California, Berkeley, as part of a collaborative program between the University of Tokyo and UC Berkeley. Motivated by the particular relevance and importance of social-scientific approaches to various crucial aspects of nuclear technology, special emphasis was placed on integrating nuclear science and engineering with social science. The book consists of the lectures given in 2011 summer school and additional chapters that cover developments in the past three years since the accident. It provides an arena for discussions to find and create a renewed platform for engineering practices, and thus nuclear engineering education, which are essential in the post-Fukushima era for nurturing nuclear engineers who need to be both technically competent and trusted in society.

The first volume in the Ashgate Studies in Resilience Engineering series deals with important issues such as measurements and models, the use of procedures to ensure safety, the relation between resilience and robustness, safety management, and the use of risk analysis. The chapters utilize a report from a serious medical accident to illustrate more concretely how resilience engineering can make a difference, both to the understanding of how accidents happen and to what an organization can do to become more resilient.

A Guidebook

The ETO Principle: Efficiency–Thoroughness Trade-Off

Governance and Control of Financial Systems

Disaster Resilience

Resilience Engineering

A Resilience Engineering Approach for the Evaluation of Performance Variability

Recent Advances in Earthquake Engineering

*As more companies move toward microservices and other distributed technologies, the complexity of these systems increases. You can't remove the complexity, but through Chaos Engineering you can discover vulnerabilities and prevent outages before they impact your customers. This practical guide shows engineers how to navigate complex systems while optimizing to meet business goals. Two of the field's prominent figures, Casey Rosenthal and Nora Jones, pioneered the discipline while working together at Netflix. In this book, they expound on the what, how, and why of Chaos Engineering while facilitating a conversation from practitioners across industries. Many chapters are written by contributing authors to widen the perspective across verticals within (and beyond) the software industry. Learn how Chaos Engineering enables your organization to navigate complexity Explore a methodology to avoid failures within your application, network, and infrastructure Move from theory to practice through real-world stories from industry experts at Google, Microsoft, Slack, and LinkedIn, among others Establish a framework for thinking about complexity within software systems Design a Chaos Engineering program around game days and move toward highly targeted, automated experiments Learn how to design continuous collaborative chaos experiments*

*The proceeding from Third Resilience Engineering Symposium collects the papers presented on October 28-30, 2008, in Antibes-Juan-les-Pins, France. The Symposium provided a much appreciated forum for people working within the area of Resilience Engineering to become updated with the latest scientific achievements as well as more practical oriented applications, and exchange views and idea within the area. Resilience Engineering represents a new way of thinking about safety that has already given rise to several practical applications. In contrast to established risk management approaches that are based on hindsight and emphasise error tabulation and calculation of failure probabilities, Resilience Engineering looks for ways to enhance the ability of organisations to create processes that are robust yet flexible, to monitor and revise risk models, and to use resources proactively in the face of disruptions or ongoing production and economic pressures. In Resilience Engineering failures do not stand for a breakdown or malfunctioning of normal system functions, but rather represent the converse of the adaptations necessary to cope with the real world complexity. Individuals and organisations must always adjust their performance to the current conditions; and because resources and time are finite it is inevitable that such adjustments are approximate. Success has been ascribed to the ability of groups, individuals, and organisations to anticipate the changing shape of risk before damage occurs; failure is simply the temporary or permanent absence of that. The First Resilience Engineering Symposium was held in Söderköping, Sweden, on October 25-29 2004. The Second Resilience Engineering Symposium was held in Juan-les-Pins, France, on November 8-10 2006. The current and future developments in Resilience Engineering will be covered by the Ashgate Studies in Resilience Engineering.*

*This thesis demonstrates the need to develop systemic safety assessment methods to account for the effect of performance variability on air traffic management safety. Like most modern socio-technical systems, air traffic management is so complex that it is impossible for it to be completely described. As consequence, performance cannot be completely specified because it must vary to meet performance demands. Performance variability is an inevitable asset to ensure the functioning of an organisation and at the same time can be harmful for system safety when it combines in an unexpected manner. This argument clearly indicates the need for safety assessment methods that can deal with performance variability. The Functional Resonance Analysis Method (FRAM) has the ability to model performance variability. However parts of the FRAM can be improved to expand its capabilities to evaluate performance variability. This thesis addresses this weakness and develops a methodology for the evaluation of performance variability. The methodology has been applied on a safety assessment case study for the German air traffic management domain. The results have been compared with the official results of a traditional safety assessment. The comparison shows the added valued of the proposed methodology. In particular it illustrates the possibility to identify emergent risks and human contribution to system safety.*

*This proceedings provides novel concepts and techniques for air traffic management (ATM) and communications, navigation, and surveillance (CNS) systems. The volume consists of selected papers from the 5th ENRI International Workshop on ATM/CNS (EIWAC2017) held in Tokyo in November 2017, the theme of which was "Drafting Future Skies". Included are key topics to realize safer and more efficient skies in the future, linked to the integrated conference theme consisting of long-term visions based on presentations from various fields. The proceedings is dedicated not only to researchers, academicians, and university students, but also to engineers in the industry, air navigation service providers (ANSPs), and regulators of aviation.*

*Advancing Resilient Performance*

*Safety-I and Safety-II*

*Resilience Engineering in Practice, Volume 2*

*Select Proceedings of VCDRR 2021*

*Preparation and restoration*

*Proceedings of ESREL 2018, June 17-21, 2018, Trondheim, Norway*

*Foundations of Safety Science*

**Resilience engineering has since 2004 attracted widespread interest from industry as well as academia. Practitioners from various fields, such as aviation and air traffic management, patient safety, off-shore exploration and production, have quickly realised the potential of resilience engineering and have become early adopters. The continued development of resilience engineering has focused on four abilities that are essential for resilience. These are the ability a) to respond to what happens, b) to monitor critical developments, c) to anticipate future threats and opportunities, and d) to learn from past experience - successes as well as failures. Working with the four abilities provides a structured way of analysing problems and issues, as well as of proposing practical solutions (concepts, tools, and methods). This book is divided into four main sections which describe issues relating to each of the four abilities. The chapters in each section emphasise practical ways of engineering resilience and feature case studies and real applications. The text is written to be easily accessible for readers who are more interested in solutions than in research, but will also be of interest to the latter group.**

**For Resilience Engineering, 'failure' is the result of the adaptations necessary to cope with the complexity of the real world, rather than a breakdown or malfunction. The performance of individuals and organizations**

must continually adjust to current conditions and, because resources and time are finite, such adjustments are always approximate. This definitive new book explores this groundbreaking new development in safety and risk management, where 'success' is based on the ability of organizations, groups and individuals to anticipate the changing shape of risk before failures and harm occur. Featuring contributions from many of the worlds leading figures in the fields of human factors and safety, Resilience Engineering provides thought-provoking insights into system safety as an aggregate of its various components, subsystems, software, organizations, human behaviours, and the way in which they interact. The book provides an introduction to Resilience Engineering of systems, covering both the theoretical and practical aspects. It is written for those responsible for system safety on managerial or operational levels alike, including safety managers and engineers (line and maintenance), security experts, risk and safety consultants, human factors professionals and accident investigators.

Resilience and Reliability on AWS

A National Imperative

Jousting with Dragons

Developing the Resilience Potentials

Safety-II in Practice

Development and Application of the Functional Resonance Analysis Method for Air Traffic Management Safety Assessment

Resilience Engineering Perspectives, Volume 2