## Editorial

*Terje Aven*
*ESRA Chairman*
*University of Stavanger,*
*Norway*

I hope you are all fine enjoying this post-ESREL conference period. The days in Zurich were great, with a number of interesting presentations and discussions. I have received many positive feedbacks expressing that the conference was a success, and not only because of its scientific content – equally important people see the conference as a meeting place for social networking, and that I think is essential for ensuring that the ESREL conference continues to have a so strong position as it has in our field. Thanks again to all who contributed to make this an unforgettable event. You can read more about the conference elsewhere in this Newsletter.

The preparation for the ESREL 2016 conference in Glasgow is going well. In the ESRA General Assembly (GA) meeting on the 8th September, Tim Bedford and Lesley Walls from the University of Strathclyde gave a presentation of the status of the work on this conference, and things look very good. The conference has a special focus on industry and innovation, and I hope to see many of you there. The planning for writing an abstract can soon start.

The GA approved the venue also the ESREL 2017 conference. It will be in Slovenia, Portorož at the coast, in the Grand hotel Bernardin, June 18-22, 2017. Professor Marco Cepin will be the general chair of the conference. Congratulations Slovenia and Marco; the hard preparation work can start.

I am pleased to read in this issue of the Newsletter, the report from Elena Zaitseva, following the International Conference on Information and Digital Technologies 2015 (IDT 2015), held in Zilina, Slovakia, 7-9 July 2015. ESRA provided financial and organizational support for the conference. There are many conferences and workshops addressing issues on reliability, safety and risk, linked to different types of applications, and it is great to see that ESRA can contribute in this way to their successful realisation.

With kind regards,
Terje Aven
Chairman of ESRA

## Feature Articles

### RAM simulation of railway operational sections

*Dr Stephen M. Famurewa*
*Division of Operation and Maintenance Engineering*
*Luleå University of Technology*
*Sweden*

Railway infrastructure is a linearly distributed asset which has different hierarchical levels such as lines, operational sections, assemblies, modules and maintainable components. It is ideal to assess the integrity or RAM of the infrastructure on the level of operational sections to facilitate action plans. There are several approaches that are used to evaluate the RAM

characteristics of a system. An event based simulation method with Monte Carlo technique has been used for RAM simulation of railway operational sections. The outcome of the simulation is the estimation of different RAM parameters during the operation phase of the infrastructure. Amongst the parameters are: expected number of failures, states of each operational section and success rate of planned traffic. These parameters are integrity measures that are useful for logistic support planning as required for cost effective and highly dependable infrastructure management.

1.  Methodology

The methodology can be described as a black box stochastic simulation of failure events and restoration actions. The simulation involves modelling of failure events using estimated failure rate for different failure modes in a stochastic process. Repairs are initiated based on the assumed corrective maintenance models. In addition, the PM tasks are initiated following schedule, resources and available time. This approach is presented in Figure 1.
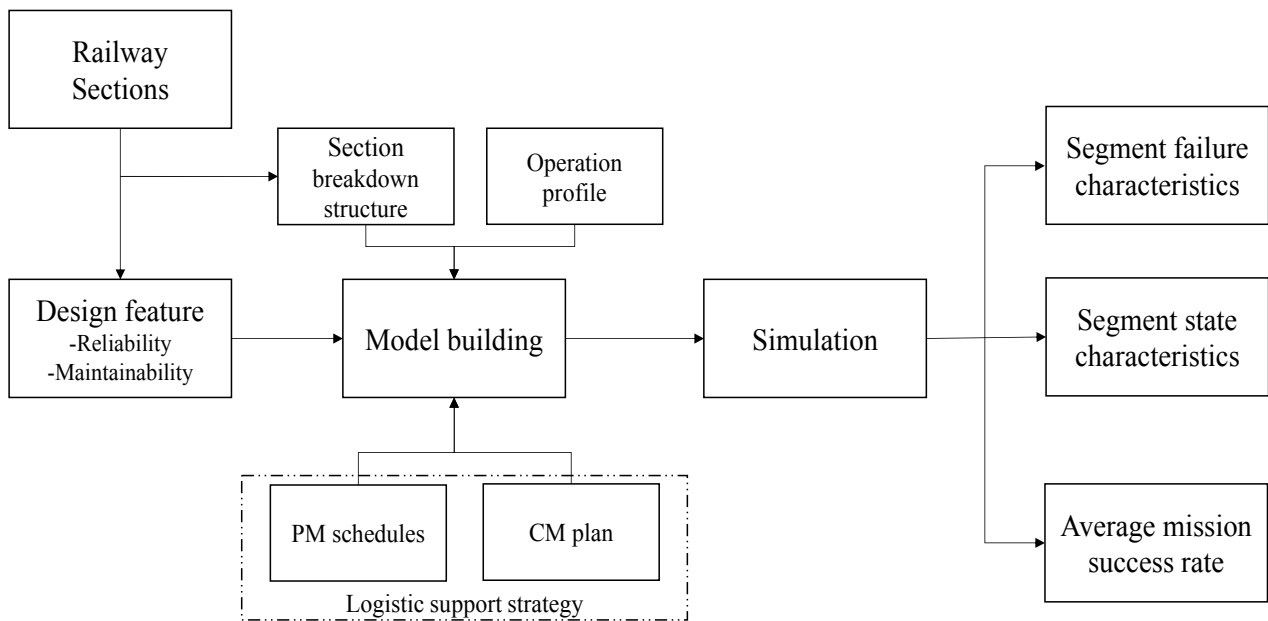


Figure 1: Description for RAMS simulation approach

The major steps in the simulation include: simplification and characterization of the railway line as shown in Figure 2. Each of the sections have the following assemblies: track structure, switches and crossing, signal, power and other systems. The second major input into the simulation model is the logistic support plans and models. The third major input into the model is a simplified train mission profile or traffic schedule on the line.

Figure 3 shows a schematic picture of the possible states of the section considered in the simulation procedure. The availability and unavailability of the operational sections are estimated using equation **Error! Reference source not found.** - **Error! Reference source not found.**.

$$\text{Availability } (A) = \frac{Uptime}{Uptime + Downtime} \tag{1}$$

$$\text{Unavailabilty due to Repair} (U_r) = \frac{Repair\,time}{Uptime + Downtime} \tag{2}$$

$$\text{Unavailabilty due to PM} (U_{PM}) = \frac{PM\,Time}{Uptime + Downtime} \tag{3}$$

$$\text{Unavailabilty due to Logistic delay} (U_{LD}) = \frac{Logistic\,time}{Uptime + Downtime} \tag{4}$$
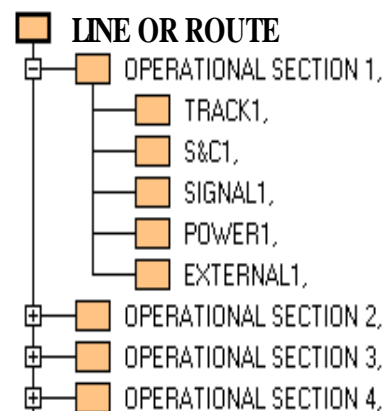


Figure 2: Simplified configuration of railway infrastructure for RAM analysis
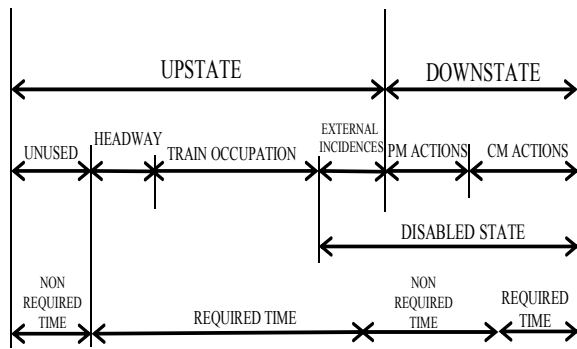
Figure 3: Description of the state of a system or operational sections

## 2. Result

There are many aspects of RAM characteristics that can be assessed and monitored from the simulation model. Figure 4 shows that the total unavailability of the sections ranges from 0.26 to 1.1% of the total time. Logistic delay is remarkably high for sections 7, 2, 9, 12, 13, 15 due to logistics constraint of the sections and high failure frequency. The characteristic PM states are quite consistent for all the sections since the PM plan is similar for the entire line in the case study. On the other hand, the unavailability due to repair has large variation since the failure characteristic of the sections differ. Overall, sections 7, 2 and 13 have the highest total unavailability on the line.
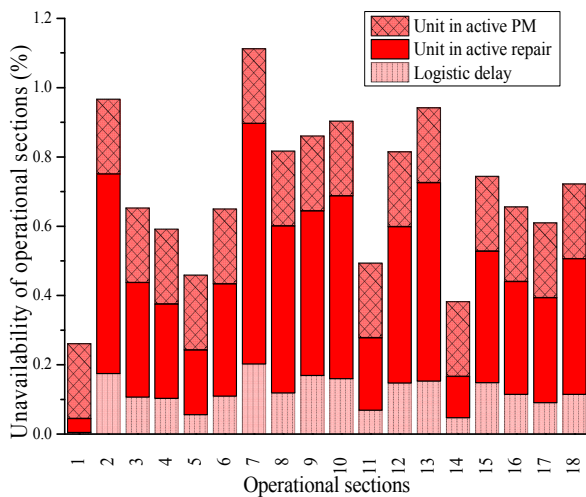


Figure 4: Unavailability of the operational sections using the base scenario

An important aspect of RAM simulation is to present the performance of infrastructure in terms of how well planned mission profiles are carried out on the entire line. A planned train mission is regarded to be successful if it is completed within the quality level required for the mission type. For the case study, the average train mission success over the entire line is 90.3, 92.9 and 95.4% for the worse, base and best

scenarios respectively (see Figure 5). This shows how the condition of the asset with certain maintenance logistic strategy is able to support planned train schedule.
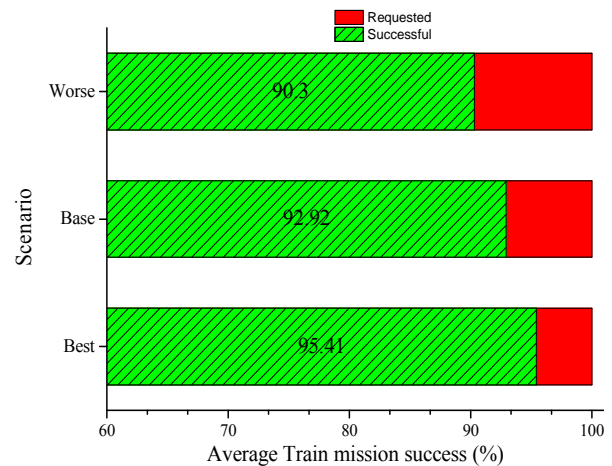


Figure 5: Average train mission success for each simulation scenario

It is however important to consider some level of confidence in the analysis of train mission success to make the result probabilistic and more practical. Different mission success is achieved during each replication for the different scenarios. Figure 6 shows the confidence level of achieving a specified train mission success for a specific scenario. For example, with the present maintenance condition and present mission profile, the maintenance department can assure between 87.8% and 93.8% successful train mission with 90% confidence level even in the best or worst scenario of infrastructure behaviour.
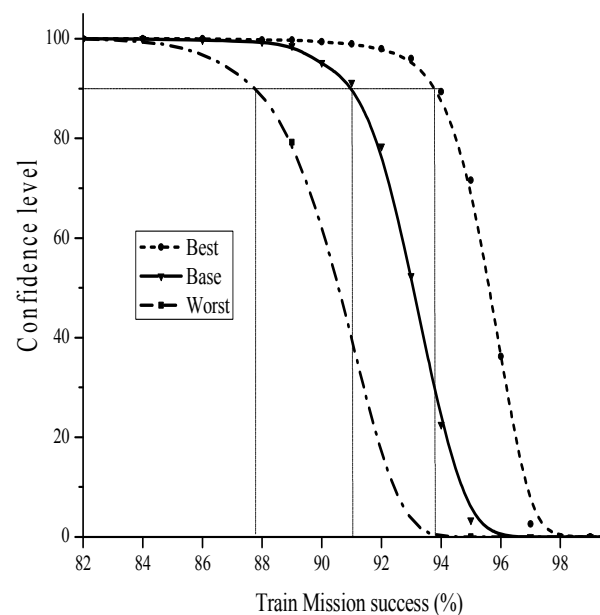


Figure 6: Train mission success with confidence level for the 3 performance scenarios.

3. Conclusion

The output of the simulation gives integrity measures useful for bottleneck identification, availability assessment and logistic support planning of railways.

---

# PhD Degrees Completed

---

## Risk analysis in maritime transportation: principles, frameworks and evaluation

*Floris Goerlandt*
*Aalto University, Finland*
*Supervisor: Prof. Pentti Kujala*
*Advisor: Dr. Jakub Montewka*

Floris Goerlandt recently completed his doctoral dissertation in the field of maritime risk analysis at the Aalto University in Espoo, Finland. The thesis is entitled "Risk analysis in maritime transportation: principles, frameworks and evaluation" and was successfully defended in a public defence which was attended by representatives from various maritime stakeholders in Finland. Prof. Terje Aven from Stavanger University served as opponent in the defence.

The main concern addressed in the thesis is the need for focusing on foundational issues. In the general risk analysis discipline, there is a recent increased focus on issues like concepts, terminology, theories, principles and frameworks for analysing, communicating and managing risk. Nevertheless, such discussions are not yet much addressed within specific application areas, despite the fact that risk analysis has attracted a growing interest in academia and authorities concerned with maritime transportation, and despite the fact that relatively many models and applications have been presented in the literature. Hence, this thesis attempts to make a bridge between the foundations of risk analysis and the practical application area concerned with maritime transportation risk analysis.

The central questions of the thesis address following issues. What are suitable principles for risk analysis in the maritime transportation system? How can these principles be transformed into practical frameworks? How can the results of a risk analysis can be evaluated, i.e. how to establish credibility of a risk analysis according to the proposed principles?

To support these central questions, two studies were undertaken based on the state of the art in maritime transportation risk analysis. A first study highlights the diffuse and even rather chaotic situation concerning foundations (definitions, perspectives and scientific approaches) in applications dealing with accidental risk in waterways. A second issue focuses on the reliability of risk analyses through case studies of accidental risk in waterways and risk models for collision alert systems, finding that these analyses rank the risk quite differently in different waterways and in different navigational encounter situations. These studies support the need for increased research on principles, frameworks and evaluation.

The principles address issues such as terminology, reliability, risk models and prediction, risk model use and the consideration of uncertainty and bias. Based on the proposed principles, two frameworks for risk analysis are developed, one for policy-oriented and one for operational risk analysis. These two-stage risk analysis frameworks are illustrated through extensive case studies addressing accidental oil spill risk in waterways and ship-ship collision alert systems. Finally, the evaluation of risk analyses, i.e. the issue of establishing credibility of a risk analysis is considered by proposing a framework to this effect, which includes several evaluation criteria.

The work acknowledges that other frameworks can be feasible, and also that there remain many open foundational issues to be addressed. In this sense, the main intention of the dissertation is to establish a basis for working further on foundational issues in the maritime transportation risk analysis application area.
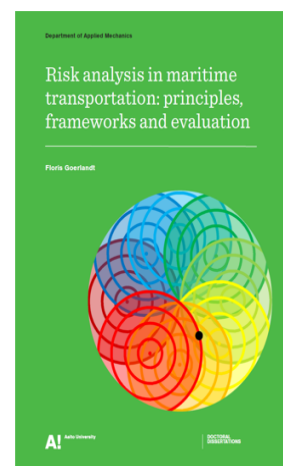
The electronic version of the dissertation is available at: http://urn.fi/URN:ISBN:978-952-60-6314-0

# ESRA News

## Research on human-centered design of ships



In September 2015 the EU FP7 funded research project Cyclades (Crew-Centered Design and Operations of Ships and Ship Systems) was finalized. The project aimed at increasing the safety of shipping by improving the current lack of implementation of human-centered design (HCD) principles in workspace and equipment design. A multi-disciplinary team of operators, representatives from research institutes and classification societies has investigated where the barriers to human element integration occur, and how to best locate, produce, disseminate, and apply human element knowledge within the context of shipping.

In the first phase of the project causes of maritime accidents and incidents were investigated. An accident database was established and populated with data available from accident reports, incident reports, interviews and a questionnaire survey. The accidents and incidents were analysed with respect to the role of the human element. Fatigue and work overload are important causes for ship accidents; therefore eye-tracking and movement sensors have been employed and enhanced to measure the current stress-level of the bridge personnel.

Existing human factors and ergonomics recommendations to be applied in ship design process were compiled and analysed regarding their applicability in the second phase of the project. Another aim of this phase was to discuss how usability can be evaluated by regulators and how usability requirements can be provided that enables the equipment and system designer to develop products with better usability and to allow the regulator to measure usability.

The focus of the third project phase was to support maritime stakeholders with applicable HCD material. In this phase an E-learning platform and a web-based toolbox ("CyClaDes Framework") have been developed. Furthermore a new edition of the Book "Improving ship operational design" has been published. In the final phase of CyClaDes the practical applicability of HCD methods was tested. Different design exercises have been performed and evaluated.

For more information please visit the project public websites:

*Project website:* www.cyclades-project.eu

*CyClaDes framework:* http://framework.cyclades-project.eu/CyClaDes-Framework/

*CyClaDes E-Learning platform:* http://elearning.cyclades-project.eu/

# Past Safety and Reliability Events

## Center for Resilience and Safety of Critical Infrastructure (CRESCI) was established by Prof. Rui Kang and Prof. Enrico Zio

Critical infrastructures are cyber and physical facilities or systems vital for a society, a country or an organization, as they strongly influence government operation, economic prosperity, life quality and national defense. These systems cover diverse fields like communication, energy, electric power, aviation, aerospace, marine, transportation, finance, etc. Resilience and safety analyses of critical infrastructures are of great importance and are receiving great attention throughout the World. To meet these challenges, Center for Resilience and Safety of Critical Infrastructure (CRESCI) was established jointly by Prof. Rui Kang from Beihang university and Prof. Enrico Zio from Politecnico di Milano and CentraleSupelec, on April, 7, 2015.



CRESCI is a research & training institution focusing on promoting methodological researches and engineering applications concerning the resilience and safety of critical infrastructures, with the following Institutional purposes:

a) Promote and carry out research in basic theories and new technologies for the analysis, assessment and management of complex systems and critical infrastructures resilience and safety, with particular attention to developing and extending such theories and technologies for application in the engineering fields above mentioned;

b) Promote, support and organize highly qualified educational activities, such as technology and academy exchanges, specialization courses, refresher courses, master and doctoral programs, specialized conferences, to train and develop international professional talents in complex systems and critical infrastructures resilience and safety analysis, assessment and management;

c) Perform professional consulting and research in favor of organizations, institutions and government departments with respect to complex systems and critical infrastructures resilience and safety analysis, assessment and management, for spreading the Research Center's international academic culture, awareness and knowledge.

As the first activity held by CRESCI, a serious of training courses were provided to the Chinese industry regarding resilience and safety analysis of critical infrastructure. The topics include: Advanced Computational Methods for the Reliability and Risk Analysis of Complex Systems (Given by Prof. Enrico Zio), Reliability Testing and Evaluation Methods for Cyber Physical Systems (Given by Prof. Rui Kang), Network Reliability: Problems and Technological Solutions (Given by Prof. Ning Huang), Evaluation of Reliability and Safety of Cloud Computing Systems (Given by Dr. Mingzhu Luo) and Coupled Networks and Cascading Failures in Cyber Physical Systems (Given by Prof. Daqing Li). Over 200 participants from the Chinses industry took part in the training courses.

The latest news of CRESCI can be found at: cresci.buaa.edu.cn.

# The International Conference on Information and Digital Technologies 2015 (IDT 2015)

## Zilina, Slovakia, 7-9 July 2015

The International Conference on Information and Digital Technologies 2015 (IDT 2015) was supported by ESRA. This conference was organized by team from University of Zilina (Slovakia) and held in Zilina on July 7-9 (http://idt.fri.uniza.sk/idt2015). The conference obtained the technical support of the IEEE Reliability Society too. The conference IDT was developed as branch from the International Conference on Digital Technologies. The thematic of the conference IDT is oriented on information technologies mostly, but this conference is multidisciplinary, and covers a number of topics within digital signal processing, information technologies, reliability, risk and safety, testing and fault-tolerant systems, etc. The main aim of the conference is to bring together researches, teachers from academy as well as industry. The one of principal goals of the conference is increase of its scientific level. More than 135 papers from 23 countries were submitted. About 60 papers were selected on the basis of reviews. Every paper has been reviewed at least two reviewers. Therefore the accepted paper rate is near 44 %. The approved papers are organized into 12 working sections and poster sections. In the plenary sessions, distinguished plenary speakers give a review of the future perspectives in their research areas: reliability, information technologies and biomedical informatics. Next plenary presentations were at the conference:

- Prof. Krzysztof Kołowrocki (Poland), Reliability of Large and Complex Systems: Asymptotic Approach Research
- Radim Bris (Czech Republic), New Computing Technology in Reliability Engineering
- Prof. Michitaka Kameyama (Japan), Prospects of Computing Platform for Real-World Intelligent Systems
- Dr. Iosif I. Androulidakis (Greece), When smartphones are neither available nor green
- Dr. Krzysztof Pancerz (Poland), Toward Classification of Data Coming from Evaluation Sheets of Subjects with ASDs

Multidisciplinary character of the Conference was conditioned by the organization of some Workshops under the Conference that thematically agree with principal investigate areas and topics of the Conference. One of these Workshops is International Workshop on Reliability Technologies (RT 2015). The problems of reliability engineering were discussed at the Conference intensively. All papers presented at this Workshop were included in the Conference Proceedings. The Program Committee of this Workshop was formed by internationally recognized experts. Co-chairs of this Workshop Prof. Radim Briš (Czech Republic) and Prof. Enrico Zio (France, Italy) significantly contributed to organization of the RT 2015.

Our organizational team is grateful to the chair of the conference Prof. Enrico Zio of his encouragement and help in organization and development the Conference and the Workshop. We thank all members of the Program Committee for the support of reviewing process. Their work to improve the scientific level of the Conference is greatly appreciated. And we are thankful to Prof. Radim Briš (Czech Republic) of active work in Program Committee. Also I would like to acknowledge the local organizing committee from the University of Zilina (the firstly, to Josef Kostolny and Miroslav Kvassay for technical and administrative help during the Conference).

Beside the scientific field, several cultural and social events held in pleasant atmosphere. Participants visited to historical attractions as Bytca town (Wedding Palace) and Orava Castle.

The Conference Proceedings of IDT 2015 has been included in the well-known scientific repository IEEEXplore (http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=7180534 ).

The scientific level of a conference is most important criterion. This level can be indicated by a conference proceedings indexing in well-known scientific repositories as IEEEXplore, Scopus and Web of Science. This indexing guarantees good scientific level of accepted papers. Therefore careful and objective

reviewing is principal step in a conference preparation. As a rule, members of Program Committee and some involved reviewers review all submissions and they must have necessary experience to decide about novelty and scientific significance of submissions. So assurance of a conference scientific level starts from forming of significant Program Committee. The next important step in the conference preparation is decision about part of accepted papers. The reviewing does not increase scientific level of a conference if the part of accepted papers is about 90%. For our Conference we reduce part of accepted papers every year. We try to organize the Conference with high scientific level and not numerous participants, and to create atmosphere and conditions for actual and interesting presentation, discussions and cooperation. Therefore submissions of PhD students and young researchers have low chance to be published in the Conference proceedings. One of decision of this problem is preparing of the special section/workshop and publication for young researchers. In this year it was section CERES. This section was supported by Tempus.

These organization aspects were possible because of financial and organization support of ESRA. Thanks to this support we were able to support of invited lectures at the Workshop and cover participation of PhD students and young researches. Therefore the support of ESRA was very important for the organization team of the conference IDT 2015.

In 2016 year next Conference will be organized and held in Rzeszów (Poland) on July 5-7 2016. Our team hopes that IDT 2016 (http://idt.fri.uniza.sk) will involve a lot of participants in reliability engineering and the Workshop on Reliability Technology will obtain impulse to increase scientific level.

# ESREL 2015

## Zürich, Switzerland
## 7-10 September 2015

The 25th edition of the ESREL conference, ESREL 2015, was held in Zürich, at ETH, the Swiss Federal Institute of Technology, 7-10 September. ESREL 2015 has been a great success: about 580 papers were presented and 600 participants attended!

Attendees came from all over the world. Besides local participation from Switzerland, the solid participation from ESREL core countries was confirmed: Norway, France, Germany, UK, Italy, Poland. China came in large numbers: this new, big, world player is looking at the ESREL community as an important reference for their safety and reliability

More than 850 abstracts were initially submitted, followed by 650 submitted full papers. The Technical Committee reviewed all submitted papers and accepted the 580 papers after the double review typical of ESREL. The review process was managed by about 30 track directors, acknowledged experts in the various technical areas. Key support came from the ESRA

Technical Committees Chairs, who traditionally contribute to managing the review process and effectively pass experience on through the various ESREL editions. In all, about 200 reviewers were involved. The care of the reviewers to provide comments and of the authors to revise their paper was particularly appreciated, and rewarding for the hard job of the technical committee. This really shows the engagement of our community to keep advancing on the state-of-the-art. .
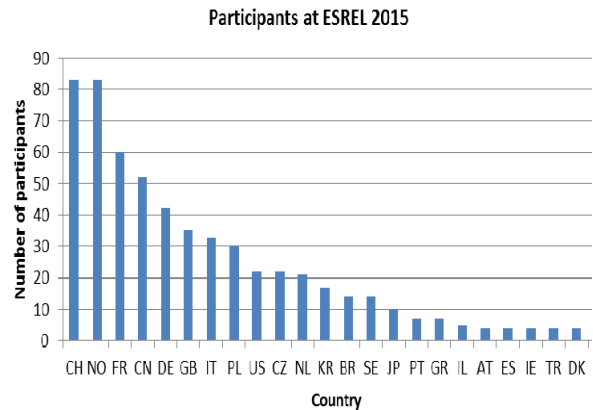


The technical program was organized over about 130 sessions, addressing both methodological and application aspects of the safety and reliability field.

However, the sessions were rarely purely methodological or purely application-oriented; much of the sessions had these two elements blended: this is the encouraging sign that the methodologies developed are finding application in the real world, and in the end are making an impact on the society. The perspective of the presented works is also getting broader: problems are tackled at the system level much more than at the component level, addressing interdependencies, socio-technical aspects, issues, tools and implications for decision-making. Some new hot topics for society are emerging at ESREL as well: papers addressing big data, autonomous systems, smart grids are becoming visible. Along with novel problems, fundamental issues are still being addressed. Having a common foundation is very important for our cross-disciplinary field to fully profit for cooperation among all disciplines.



Prestigious keynote speakers offered their perspective on key topics such as managing the unexpected in various sectors and running an essential infrastructure

for the wellbeing of millions: Prof. Paul Embrechts (ETH Zuerich), Prof. Nassim Taleb (New York University), Prof. Didier Sornette (ETH Zuerich), Mr. Pierre-Alain Graf (CEO SwissGrid), Prof. Pieter van Gelder (TU Delft), Prof. Christophe Berenguer (Grenoble Institute of Technology), and Prof. Antoine Grall (Université de Technologie de Troyes).

The successful experience of plenary talks by the ESRA Technical Committee chairs continued this year as well with Pieter van Gelder, Christophe Berenguer, and Antoine Grall. Profs. Enrico Zio and Terje Aven hosted a panel discussion on uncertainties: this is probably "the" fundamental topic for risk analysis and as such continues to attract attention.

The support of the ESREL 2015 sponsors, SwissRe, AXA Winterthur and the City of Zurich, is gratefully acknowledged. We thank Professor Emeritus Wolfgang Kröger for serving at the ESREL 2015 Honorary Chairman and for providing guidance in selecting complex engineered systems as the Conference theme. We gratefully acknowledge the Chairs of the ESRA Technical Committees, the members of the ESREL 2015 Technical Program Committee, and the ESREL 2015 reviewers for volunteering their time. We also thank the ESREL 2015 Keynote Speakers for offering their unique perspectives on risk, safety and reliability at the Conference. Finally, we are deeply obliged to the ESREL 2015 Organization Team without whom ESREL 2015 would not have taken place.

A toast to all the people who have helped and all the authors and participants how made the event real!



# Calendar of Safety and Reliability Events

## 13th International Probabilistic Workshop (IPW2015)

Liverpool, United Kingdom
4th - 6th November 2015

The conference is intended for civil and structural engineers and other professionals concerned with structures, systems or facilities that require the assessment of safety, risk and reliability. Participants could therefore be consultants, contractors, suppliers, owners, operators, insurance experts, authorities and those involved in research and teaching.

**Key topics:** Safety, Risk, Probabilistic Computation, Reliability, Structural Safety

**Conference Language:** English
**Conference Chairs:**
Edoardo Patelli, Institute for Risk & Uncertainty, UK
Ioannis Kougioumtzoglou, Columbia University, USA
**Conference co-Chairs:**
Michael Beer, Institute for Risk & Uncertainty, UK
Ivan S.K. Au, Institute for Risk & Uncertainty, UK
Dirk Proske, University of Natural Resources and Life Sciences, Vienna, Austria

Secretariat

IPW2015 Secretary
Institute for Risk and Uncertainty
The Quadrangle
University of Liverpool
Brownlow Hill
Liverpool
L69 3GH
United Kingdom
Tel: +44 (0)151 794 5224
Fax: +44 (0)151 794 4703
Email: info@ipw2015.org

Conference Website: http://www.ipw2015.org

# 2nd International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management - SMRLO'16

Beer Sheva, Israel
15th-18th February 2016

Symposium Chairs: Dr. Ilia Frenkel and Dr. Anatoly Lisnianski

The Second International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management (SMRLO'16), will be held on February 15-18, 2016 at the SCE - Shamoon College of Engineering, Beer Sheva, Israel. This will be a continuous and enlarged symposium following the International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management (SMRLO'10) held in 2010.

This SCE symposium will constitute a forum for discussing different issues of Stochastic Models in Reliability Engineering, Life Science and Operations

Management with respect to their applications. The symposium objective is to assemble researchers and practitioners from universities, institutions and industries from around the world, involved in these fields, and to encourage mutual exchange.

Common methods and models will be considered from a general point of view; theoretical modeling, computational and case studies will range from academic considerations to industrial approaches, as well as emphasizing topics on cooperation between industries and research institutions. The cooperation that will contribute to the advancement of research and solutions to engineering issues is of utmost importance.

The proceedings of **SMRLO'16** will be published by IEEE CPS and will be available in the *IEEE XPlore Digital Library*.

Important dates

**May 1, 2015 -** Proposals of Invited Sessions
**May 15, 2015 -** Announcement for Invited Session proposals acceptance
**June 15, 2015** - Abstracts submission
**June 30, 2015** - Abstracts acceptance
**September 30, 2015** - Deadline of papers submission
**September 30, 2015** - Deadline for early payment
**October 1, 2015** - 20% augmentation of fee registration
**February 15-18, 2016** - Presentation of invited and contributed papers

Conference Website: http://info.sce.ac.il/smrlo16/


# 35th International Conference on Ocean, Offshore and Arctic Engineering (OMAE2016) Symposium on Structures, Safety and Reliability

BEXCO Exhibition & Convention Center, Busan, South Korea
19th-24th June, 2016

Since 2003, the OMAE conference has more than tripled in size, with over 1,000 participants at OMAE 2015 in St. John's, Canada. We expect to set a new OMAE attendance record in Busan with the goal of exceeding 1,500 participants.

The annual OMAE conference is an international assembly of engineers, researchers, technical specialists and students in the fields of ocean, offshore and arctic engineering. It is an opportunity to meet and present advances in technology and its scientific support, exchange ideas and experiences whilst promoting technological progress and its application in industry and promote international cooperation in ocean, offshore and arctic engineering.

**Call for papers** - Authors should submit a title/abstract to begin the paper submission process. Prior to the date noted below, authors should then submit full-length manuscripts for peer review. Draft manuscripts and final-paper submissions must conform to ASME publication guidelines.

**Important Dates and Information:**

· December 14, 2015 – Deadline for Abstract Submission
· January 4, 2016 – Full-Length Draft Paper Due
· February 22, 2016 – Notification of Acceptance/ Rejection
· March 21, 2016 – Final Paper Due

**Conference Website:** www.omae2016.com


# 2016 International Conference on Quality, Reliability, Risk, Maintenance and Safety Engineering (QR2MSE 2016)

Jiuzhaigou, Sichuan, China
25th-28th July, 2016

QR2MSE 2016 & WCEAM 2016 is an international forum for exchange of innovative ideas, cutting-edge research results, and applications of asset management, reliability and quality tools in design, manufacturing, and operation and maintenance of engineering systems. Papers dealing with case studies, reliability data generation, experimental results, best design practice, and effective asset management solutions are of particular interest. All papers accepted will be included in the conference proceedings. Selected peer reviewed papers will be published in Springer's ebook proceedings and international journals indexed by Thomson Reuters Web of Science (SCI) or Engineering Village (EI Compendex).

**Topics of Interests:**
• Strategic asset management
• Prognostics and health management
• Asset fleet management • Condition based maintenance
• Quality engineering
• Quality assurance and cost issues
• Experimental design for quality control
• Total quality management techniques
• Reliability theory and application
• Product reliability and safety evaluation
• Reliability testing and statistics
• Structural reliability
• Equipment management and maintenance
• e-Maintenance
• Maintenance support modeling and simulation
• Reliability centered maintenance

• Novel technologies for maintenance: robotics, virtual reality and additive manufacturing
• Life cycle management and services
• Systems integrity management
• Software reliability and testing
• Reliability tools for product development
• Risk management
• Physics of Failure
• Inspection
• Advanced sensor technologies
• Condition monitoring, diagnostics and prognostics
• System health and analytics
• Contractor logistics theory and practice
• Optimal design
• Multidisciplinary design optimization
• Human and organisational factors
• Applications of industrial internet
• Supply chain management
• Standardisation
• Information management

**Submission of papers -** Extended abstract or full papers should be submitted electronically in MS-Word via icqrms@uestc.edu.cn by March 10, 2016. Authors' names, affiliations, and contact information must be included in submission.

**Important Dates:**
Full Paper Submission Deadline - Mar 10, 2016
Full Paper Acceptance Notification - Apr 10, 2016
Camera Ready Papers Due - Apr 30, 2016

For more information and updates, please visit conference website at www.qr2mse.org.

# ESRA Information

## 1   ESRA Membership

### 1.1   National Chapters
• French Chapter
• German Chapter
• Italian Chapter
• Polish Chapter
• Portuguese Chapter
• Spanish Chapter
• UK Chapter

### 1.2   Professional Associations
• The Safety and Reliability Society, UK
• Danish Society of Risk Assessment, Denmark
• SRE Scandinavia Reliability Engineers, Denmark
• ESReDA, France
• French Institute for Mastering Risk (IMdR-SdF), France
• VDI-Verein Deutscher Ingenieure (ESRA Germany), Germany
• The Netherlands Society for Risk Analysis and Reliability (NVRB), The Netherlands

• Polish Safety & Reliability Association, Poland
• Asociación Española para la Calidad, Spain

### 1.3   Companies
• TAMROCK Voest Alpine, Austria
• IDA Kobenhavn, Denmark
• VTT Industrial Systems, Finland
• Bureau Veritas, France
• INRS, France
• Total, France
• Commissariat á l'Energie Atomique, France
• DNV, France
• Eurocopter Deutschland GMbH, Germany
• GRS, Germany
• SICURO, Greece
• VEIKI Inst. Electric Power Res. Co., Hungary
• Autostrade, S.p.A, Italy
• D'Appolonia, S.p.A, Italy
• IB Informatica, Italy
• RINA, Italy
• TECSA, SpA, Italy
• TNO Defence Research, The Netherlands
• Dovre Safetec Nordic AS, Norway
• PRIO, Norway
• SINTEF Industrial Management, Norway
• Central Mining Institute, Poland
• Adubos de Portugal, Portugal
• Transgás - Sociedade Portuguesa de Gás Natural, Portugal
• Cia. Portuguesa de Producção Electrica, Portugal
• Siemens SA Power, Portugal
• ESM Res. Inst. Safety & Human Factors, Spain
• IDEKO Technology Centre, Spain
• TECNUN, Spain
• TEKNIKER, Spain
• CSIC, Spain
• HSE - Health & Safety Executive, UK
• Atkins Rails, UK
• W.S. Atkins, UK
• Railway Safety, UK
• Vega Systems, UK

### 1.4   Educational and Research Institutions
• University of Innsbruck, Austria
• University of Natural Resources & Applied Life Sciences, Austria
• AIT Austrian Institute of Techn. GmbH, Austria
• Université Libre de Bruxelles, Belgium
• University of Mining and Geology, Bulgaria
• Czech Technical Univ. in Prague, Czech Republic
• Technical University of Ostrava, Czech Republic
• University of Defence, Czech Republic
• Tallin Technical University, Estonia
• Helsinki University of Technology, Finland
• École de Mines de Nantes, France
• Université Henri Poincaré (UHP), France
• Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), France
• Université de Bordeaux, France
• Université de Technologie de Troyes, France
• Université de Marne-la-Vallée, France
• INERIS, France
• Fern University, Germany
• Technische Universität Muenchen, Germany
• Technische Universität Wuppertal, Germany
• University of Kassel, Germany
• TU Braunschweig, Germany

- Institute of Nuclear Technology Radiation Protection, Greece
- University of the Aegean, Greece
- Universita di Bologna (DICMA), Italy
- Politecnico di Milano, Italy
- Politecnico di Torino, Italy
- Universita Degli Studi di Pavia, Italy
- Universita Degli Studi di Pisa, Italy
- Technical University of Delft, The Netherlands
- Institute for Energy Technology, Norway
- Norwegian Univ. Science & Technology, Norway
- University of Stavanger, Norway
- Technical University of Gdansk, Poland
- Gdynia Maritime Academy, Poland
- Institute of Fundamental Techn. Research, Poland
- Technical University of Wroclaw, Poland
- Instituto Superior Técnico, Portugal
- Universidade de Coimbra, Portugal
- Universidade Nova de Lisboa - FCT, Portugal
- Universidade de Minho, Portugal
- Universidade do Porto, Portugal
- University Politechnica of Bucharest, Romania
- University of Iasi, Romania
- Slovak Academy of Sciences, Slovakia
- University of Trencin, Slovakia
- Institute "Jozef Stefan", Slovenia
- Asociación Española para la Calidad, Spain
- PMM Institute for Learning, Spain
- Universidad D. Carlos III de Madrid, Spain
- Universidad de Extremadura, Spain
- Univ. de Las Palmas de Gran Canaria, Spain
- Universidad Politecnica de Madrid, Spain
- Universidad Politecnica de Valencia, Spain
- Institute de Matematica y Fisica Fundamental (IMAFF), Spain
- University of Castilla-La Mancha, Spain
- LuleåUniversity, Sweden
- World Maritime University, Sweden
- Institut f. Energietechnik (ETH), Switzerland
- Paul Scherrer Institut, Switzerland
- City University London, UK
- Liverpool John Moores University, UK
- University of Aberdeen, UK
- University of Bradford, UK
- University of Salford, UK
- University of Strathclyde, Scotland, UK

## 1.5 Associate Members
- Federal University of Pernambuco, Brazil
- Fluminense Federal University, Brazil
- Pontificia Universidade Católica, Brazil
- European Commission - DR TREN (Transport and Energy), in Luxembourg
- Vestel Electronics Co., Turkey

## 2 ESRA Officers

**Chairman**
Terje Aven (terje.aven@uis.no)
University of Stavanger, Norway

**Vice-Chairman**
Radim Bris (radim.bris@vsb.cz)
Technical University of Ostrava, Czech Republic

**General Secretary**
Coen van Gulijk (C.VanGulijk@hud.ac.uk)

University of Huddersfield, UK

**Treasurer**
Piero Baraldi (Piero.baraldi@polimi.it)
Politecnico di Milano, Italy

**Past Chairman**
Enrico Zio (enrico.zio@polimi.it)
Politecnico di Milano, Italy

**Chairmen of the Standing Committees**
Antoine Grall, University of Technology of Troyes**,** France
C. Guedes Soares, Instituto Superior Técnico, Portugal

## 3 Standing Committees
### 3.1 Conference Standing Committee
Chairman: A. Grall, University of Tech. of Troyes**,** France

The aim of this committee is to establish the general policy and format for the ESREL Conferences, building on the experience of past conferences, and to support the preparation of ongoing conferences. The members are one leading organiser in each of the ESREL Conferences.

### 3.2 Publications Standing Committee
Chairman: C. Guedes Soares, Instituto Sup. Técnico, Portugal

This committee has the responsibility of interfacing with Publishers for the publication of Conference and Workshop proceedings, of interfacing with Reliability Engineering and System Safety, the ESRA Technical Journal, and of producing the ESRA Newsletter.

## 4 Technical Committees

**Technological Sectors**

**4.1 Aeronautics Aerospace**
Chairman: Darren Prescott, UK
E-mail: d.r.prescott@lboro.ac.uk

**4.2 Critical Infrastructures**
Chairman: G. Sansavini, Italy
E-mail: Giovanni.Sansavini@mail.polimi.it

**4.3 Energy**
Chairman: Kurt Petersen, Sweden
E-mail: Kurt.Petersen@lucram.lu.se

**4.4 Information Technology and Telecommunications**
Chairman: Elena Zaitseva, Slovakia
E-mail: Elena.Zaitseva@fri.uniza.sk

**4.5 Nuclear Industry**
Chairman: S. Martorell, Univ. Poli. Valencia, Spain
E-mail: smartore@iqn.upv.es

**4.6 Safety in the Chemical Industry**
Chairman: M. Christou, Joint Research Centre, Italy
Email: Michalis.Christou@jrc.ec.europa.eu

**4.7 Land Transportation**
Chairman: Valerio Cozzani, Italy
E-mail: valerio.cozzani@unibo.it

**4.8 Maritime Transportation**
Chairman: Jin Wang, UK
E-mail: J.Wang@ljmu.ac.uk

**4.9 Natural Hazards**
Chairman: P. van Gelder, The Netherlands
Email: p.h.a.j.m.vangelder@tudelft.nl

**Methodologies**

**4.10 Accident and Incident Modelling**
Chairman: Stig O. Johnson, Norway
Email: stig.o.johnsen@sintef.no

**4.11 Prognostics & System Health Management**
Chairman:Piero Baraldi, Italy
E-mail: Piero.baraldi@polimi.it

**4.12 Foundational Issues in Risk Assessment & Management**
Chairmen: Terje Aven, Norway & Enrico Zio, Italy
E-mail: terje.aven@uis.no; enrico.zio@polimi.it

**4.13 Human Factors and Human Reliability**
Chairman: Luca Podofillini, Switzerland
Email: Luca.podofillini@psi.ch

**4.14 Maintenance Modelling and Applications**
Chairman: Christophe Bérenguer, France
Email: christophe.berenguer@utt.fr

**4.15 Mathematical Methods in Reliability and Safety**
Chairman: John Andrews, UK
Email: John.Andrews@nottingham.ac.uk

**4.16 Quantitative Risk Assessment**
Chairman: Marko Cepin, Slovenia
E-mail: marko.cepin@fe.uni-lj.si

**4.17 Systems Reliability**
Chairman: Gregory Levitin, Israel,
E-mail: levitin@iec.co.il

**4.18 Uncertainty Analysis**
Chairman: Emanuele Borgonovo, Italy,
E-mail: emanuele.borgonovo@unibocconi.it

**4.19 Safety in Civil Engineering**
Chairman: Raphael Steenbergen, The Netherlands
Email: Raphael.steenbergen@tno.nl

**4.20 Structural Reliability**
Chairman: Jana Markova, Czech Republic
E-mail: Jana.Markova@klok.cvut.cz

**4.21 Occupational Safety**
Chairman: Ben Ale, The Netherlands
Email: B.J.M.Ale@tudelft.nl