



European Safety and Reliability Association

Newsletter

<http://www.esrahomepage.org>

September 2014

Editorial



*Terje Aven
ESRA Chairman
University of Stavanger,
Norway*

Dear ESRA members,

I am honoured of being selected as the new ESRA chairman by the ESRA General Assembly in the meeting held during the ESREL 2014 conference in Wroclaw Poland. Together with the other officers, elected Vice Chairman Radim Bris, elected treasurer Piero Baraldi and General Secretary Coen van Gulijk, I am ready for the task.

We are filled with energy and enthusiasm, and hope that we can meet the expectations of ESRA to further enhance the fields of Safety and Reliability, and increase and strengthen the specific ESRA activities to cover the broad spectrum of areas of reliability, safety and risk assessment and management.

We will follow up the work led by the former Chairman, professor Enrico Zio, who I have had the great pleasure

to work with as a Vice Chairman for four years.

I would like to express a big THANK YOU to Enrico for his work during these four years. Under his leadership, ESRA has strongly developed; the number of activities has increased and some have been revitalised like the support to workshops and seminars.

A special acknowledgment he deserves for the work he has conducted in relation to the organisational structure of ESRA. The statutes have been changed and the organization is now managed in accordance with legal requirements and commonly accepted principles for this type of organisation. I would also like to express that I personally have enjoyed this four years period very much. Enrico has been an inspiration for me, not only in relation to the professional work but also as a colleague and friend.

I am happy that he will continue to be a part of ESRA, his competence and experience this organisation is dependent on. It is also a pleasure for me to announce that he has agreed to keep up his special singing activity at the ESREL conference dinners – we simply cannot do without “o sole mio”.

Thanks Enrico.

Terje Aven
Chairman of ESRA

Feature Articles

LNG safety – an emerging and ignored issue in the climate change debate



*Frank Huess Hedlund
COWI, Kongens Lyngby,
Denmark
Technical University of
Denmark*

The emerging practice of shifting from diesel or other non-volatile oils to natural gas as a transportation fuel entails major accident risks. In the haste and hype to reduce carbon dioxide emissions (and fuel cost) the risks are often glossed over, waved away or simply ignored.

An illuminating case is the substitution of marine diesel or fuel oil for liquefied natural gas (LNG) to power marine vessels. At face value, the environmental driver is a desire to curb carbon dioxide emissions from the marine transportation sector. LNG is cheaper than diesel and while not overtly paraded, it would be naive to ignore the economic driver. It might well be defensible to use LNG on large cargo ships. They contribute significantly to that sector's CO₂ emission and the crew onboard is rather limited and may successfully transfer to a rescue vessel in case of accident.

This is not the case, however, for ferryboats and passenger vessels because of the large number of people onboard and the tremendous obstacles associated with evacuation of large numbers of passengers, some elderly, disabled or otherwise vulnerable, from a damaged vessel at sea in case of explosion and fire. A sober assessment, if one were carried out, might well conclude that the benefits from a reduction in carbon dioxide emissions are minuscule and wholly disproportionate to the increase in accident risk.

The Norwegian shipping company Fjord Line, recently introduced LNG cruise ferries operating between Bergen, Stavanger, Langesund (Norway) and Hirtshals (Denmark). The European Investment Bank (EIB) provided a EUR 124 million loan to support the development of "sustainable European sea transportation". Each of the 170 m long ferries can carry 1.500 passengers and 600 cars.

LNG fueled vessels require LNG storage and loading facilities. The facilities present a hazard to the surrounding community and certainly to the ferry terminal itself, where a large number of passengers frequently are present. A critical issue is whether fueling of the ship is permissible while passengers are onboard or nearby. The Norwegian authorities said no, and because of timetable constraints, the ferries could only partly fuel at the LNG terminal in Risavika, near Stavanger. This led to the absurd situation where large quantities of LNG fuel to the environmentally friendly and sustainable cruise ferries was hauled by (diesel-powered) road tankers via Sweden and by another ferrylink between Sweden and Denmark, eventually to reach Hirtshals by road, where Danish authorities had no such safety reservations.

In 2012, the Danish authorities carried out a North European LNG marine infrastructure feasibility study. The study considered the use of LNG tank trucks a "well established technique" and was satisfied that road traffic with LNG tank trucks is "subject to detailed national and local safety regulations" and hence, by implication, presumably constitutes a negligible risk. Potential concerns were waved away as "lack of knowledge and scaremongering". The study paid no attention at all to societal risk. Worse, critical reasoning is absent, for instance whether it is strategically sound to introduce LNG on passenger vessels.

The substitution of diesel or fuel oil for LNG runs counter to long established core principles of inherent safety and risk reduction, for instance laid down in the ATEX directive, because a low-risk fuel is substituted for a high-risk one.

Of course, technical measures can mitigate the risks, lowering the probability of an accident, but not necessarily the consequences. Using risk terminology however, some accidents have consequences of such magnitude that the risks are simply intolerable, regardless of the probability. This is, in fact, an age-old debate. Before the 1970s overly optimistic assessments of the ability to control technological risks led to the construction of nuclear power plants, major hazard chemical facilities and large inventories of toxic substances, e.g. ammonia, near population centers, sometimes even in town centers. Nowadays, those past decisions are generally considered a strategic mistake. The question is whether exuberant, parochial and uncritical climate change intervention advocates are repeating past mistakes.

PhD Degrees Completed

Contributions to the further development of the new risk perspectives



*Henning Veland
Stavanger University
Supervisor: Prof. Terje
Aven*

Henning Veland defended his PhD thesis in risk management on Friday 13. June at the University of Stavanger. The thesis is entitled "Contributions to the further development of the new risk perspectives". His supervisor was Professor Terje Aven at the Department of Economics, Risk Management and Planning. During his doctoral project, Veland has been part of the risk research community at the University of Stavanger, and SEROS – the Centre of Risk Management and Societal Safety.

His PhD thesis touches on several timely issues on how to improve the management, analysis and communication of risk in society. In his work, Veland has particularly looked at how to bring forward important aspects of risk that have often been underrepresented and -communicated, for example the treatment of uncertainties, underlying assumptions, and the strength of knowledge that risk analyses are built upon.

The thesis consists of five scientific papers, of which two of them have been published in scientific journals and three papers presented in international scientific conferences. The papers contain several case studies based on real situations, including from the offshore oil and gas industry, the 22 July 2011 terrorist attack in Norway, and the Icelandic volcanic ash cloud that paralyzed European commercial air traffic in 2010.

In the paper addressing the volcanic ash cloud, Veland defends the European authorities' handling of the incident - in contrast to the massive public criticism they received, while most airplanes were grounded in Europe. The study concludes that the European aviation authorities changed their response based on their improved level of knowledge. This was especially related to new knowledge that became available during the volcanic eruption related to how much ash particles commercial aircrafts could take. On the outbreak of the

Icelandic volcano, this knowledge was not available, and thus the policy was to restrict all aircraft operations in airspace potentially containing volcanic ash cloud particles (which can be seen as being in line with the cautionary/precautionary principle). As test flights were performed, new knowledge became available, which the decision makers used to introduce a policy partially opening airspace with low levels of volcanic ash particles.

Another part of the thesis analyses how differences in the fundamental understandings of risk among key players in society can lead to obstacles in communication of risk between them. Four key players were considered: risk analysts, subject field experts, decision-makers and the general public. Based on an evaluation and discussions of such potential communication challenges, Veland suggests different ways the communication can be improved by the actors involved.

Past Safety and Reliability Events

ESRA Workshop in Sicily - The Future of Reliability and Risk Analysis *Risk and Reliability for Civil Engineering Structures*

*Prof.dr.ir. Raphaël Steenbergen
ESRA Chair Safety in Civil Engineering*

This year, 26-27 May 2014, the initiative was taken by the ESRA board (Enrico Zio and Terje Aven) to organize a workshop concerning the future of Risk and Reliability Analysis. Location was the beautiful resort Donnafugata in Sicily, Italy.

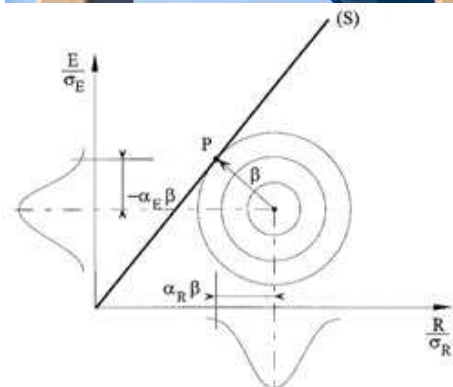




Below a short summary is given about the future issues in risk and reliability analysis for Civil Engineering Structures. Four main issues were identified: reliability assessment of existing structures, reliability analysis using advanced non-linear FEM models, better probabilistic models for loads on structures and robustness analysis.

Central task for the continued success of society is the safe development and management of civil infrastructure such as traffic infrastructure, highrise buildings, power distribution systems, water defense and water distribution systems. Reliability is a great concern because failures may have significant financial consequences and may result in injuries and loss of lives.

Today there is a wide range of techniques in development to assess risk and reliability, both in relation to safety and in the wider sense. These techniques underpin legislation on safety and have relevance over a broad spectrum of activities, where risk and reliability are key concerns. Probabilistic design makes it possible to design safe and reliable structures while avoiding costly over-design.



Existing structures

For major part of the existing buildings and infrastructure the design life has been reached or will be reached in the near future. The cost of replacing the existing infrastructure is astronomical; therefore massive and coordinated research is necessary. The safety levels of the structures need to be reassessed in order to investigate whether these structures are safe enough under the actual conditions. Over the last years, the safety philosophy for existing structures is in development. Probabilistic methods are being developed as many existing bridges are under assessment. A strong need exists to better describe all relevant parameters in statistical terms. Combination of probabilistic models and monitoring programs are promising.

Safety and non-linear FEM models

Usual civil engineering calculations with the corresponding safety formats are based on linear relationships. As building systems become increasingly more lightweight and efficient and in the case of the safety assessment of existing structures, non-linear material models enter into the scene. There is a need for a consistent non-linear-FEM oriented safety format for all materials.

Loads on structures

One of the main concerns in structural reliability is the determination of design values for load parameters based on short periods of information. In order to obtain the required safety level, these design values usually correspond to large return periods. Therefore the tails of the distributions play an important role. Better knowledge is needed about the tail behaviour of the parameters that play a role (wind, earthquake, traffic, etc) in the probabilistic model, which distribution functions should be used, are we allowed to work truncations?

Robustness

A point of increasing societal interest is the approach for accidental design situation and loads like explosion and collisions. Most codes demand in this respect that damage to the structure and the consequences thereof shall never be out of proportion compared to any initial event. This is called the robustness requirement. A probabilistic analysis is under development to combine probabilities of occurrence of accidental loads and consequences of failure.

The research is coordinated by the Joint Committee on Structural Safety (JCSS). The JCSS acts on behalf of the Liaison Committee of the following five international professional associations:

- CIB International Council for Research and Innovation in Building and Construction

- ECCS European Convention for Constructional Steelwork
- fib International Federation for Structural Concrete
- IABSE International Association for Bridge and Structural Engineering
- RILEM Reunion internationale des Laboratoires et Experts des Matériaux

The goals of the JCSS are:

- To improve the general knowledge and understanding within the fields of safety, risk, reliability and quality assurance, for all types of civil engineering and building structures, on the basis of sound scientific principles and with an open eye for the applications in practice.
- To take care that inter-associational pre-normative research in the field of Risk and Reliability is performed in an effective and adequate way.

ESRA Norway 20 years 1994 – 2014

Willy Røed

This year it has been 20 years since the Norwegian branch of ESRA was founded. The anniversary was celebrated at the Ekeberg Restaurant in Oslo on the 11th of June. The day started with presentations discussing the development of risk and reliability analysis over time, and what challenges we should be prepared for in the future. The thematic program was followed up with a tour of the sculpture park nearby and dinner in the afternoon.

The initiative ESRA Norway was made by Odd Tveit and Jan Erik Vinnem in 1993. From November 1993, before the organization was formally founded, there was a preliminary board consisting of Jan Erik Vinnem, Terje Aven, Svein Nyblin, Henrik Kortner, Odd Tveit, Tore Ulleberg and Erik Østby. This group prepared a constituting general assembly the 26th of May 1994, where the Norwegian branch of ESRA was founded and a new board was elected.

Since 1994 ESRA Norway has arranged more than 100 seminars with relevance to ESRA's subject areas. Presentations given after January 2009 are published on the web. Unfortunately for many of our members, most of the presentations are in Norwegian.

You may find more information on ESRA Norway's web page: www.esra.no (in Norwegian only).

European Safety and Reliability Conference ESREL 2014, 14th-18th September 2014

Sylwia Werbinska

This year, in September, there was held the annual European Safety and Reliability Conference ESREL 2014 in Wrocław, Poland, and was organized by the Wrocław University of Technology, the Polish Safety and Reliability Association (PSRA) and the European Safety and Reliability Association (ESRA).



Photo 1. Registration desk of the ESREL 2014 Conference

The theme of the Conference was “Safety and Reliability. Methodologies and Applications”. Such a general title well represents the program of the meeting. Originally, approximately 650 abstracts were submitted and following the review by the Technical Programme Committee about 320 full papers were accepted and are included in the program (Fig. 1).

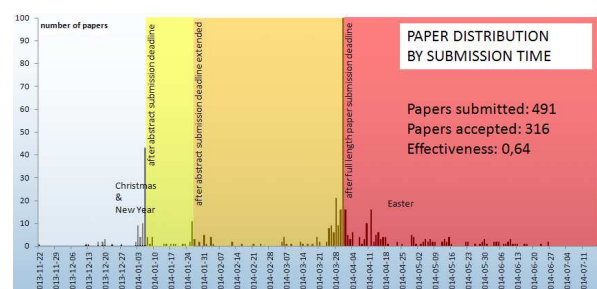


Fig. 1. Paper distribution process by submission time

The Conference covers 17 methodological tracks and 21 application areas and provides a forum for presentation and discussion of scientific papers concerning theory, techniques, methods and developments related to indicated problems (Fig. 2 – 3).

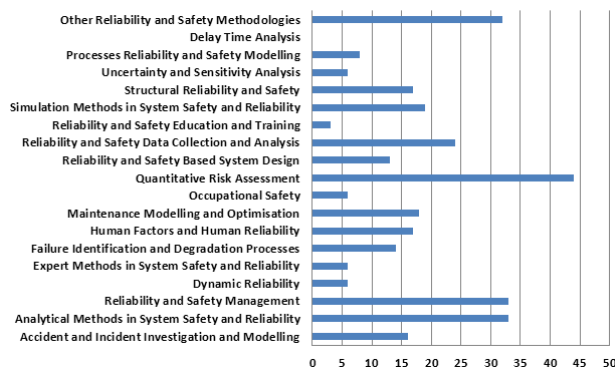


Fig. 2. Papers distribution by Methodology area (total 316)

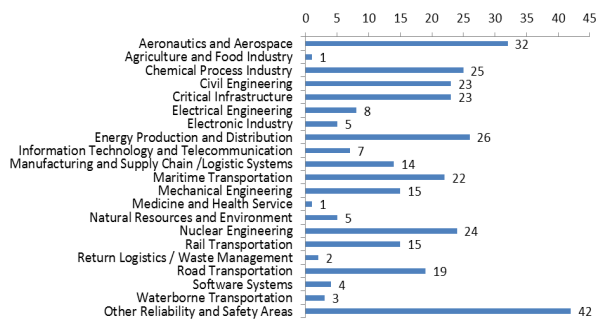


Fig. 3. Papers distribution by Application area (total 316)

One of the methodological tracks, which gathered the greatest number of papers were Quantitative Risk Assessment (34 papers), Analytical Methods in System Safety and Reliability (33 papers), and Reliability and Safety Management (33 papers). In these tracks the wide range of papers regarded such areas as chemical process industry, critical infrastructures and transportation systems (water, air, land). Worth mentioning is also the area Reliability and Safety Education and Training (only 4 papers), where authors gave the tips e.g. how to perceive the safety in public buildings or road tunnels. Special interest should be also given to the new application tracks Manufacturing and Supply Chain/Logistic Systems, and Return Logistics/Waste Management where the issues of dependability of supply chains and production systems were widely analysed.

As a result, The XXIV edition of the conference, ESREL 2014 provided a forum for presentation and discussion of scientific works covering theories and methods in the field of risk, safety and reliability, and their application to a wide range of industrial, civil and social sectors and problem areas. ESREL 2014 was also an opportunity for researchers and practitioners, academics and engineers to meet, exchange ideas and gain insight from each other.



Photo 2. Opening Ceremony of the ESREL 2014 Conference

The conference programme included 62 sessions organized in 5, 6 or 7 parallel streams (309 presentations) and 8 keynote lectures given in plenary sessions starting each day of the meeting. The estimated efficiency of presenters was about 85%.

The plenary lectures contained:

P1. Challenges and Developments in Maritime and Port Security Assessment

Speaker: Jin Wang, Liverpool John Moores University

P2. Bayes Statistical Decisions with Random Fuzzy Data - An Application in Reliability

Speaker: Olgierd Hryniewicz, Systems Research Institute, Warsaw

P3. Prognostics and Health Management System

Speaker: Piero Baraldi, Politecnico di Milano

P4. New Topics of Occupational Safety and Health Research in Poland

Speaker: Daniel Podgórski, Central Institute for Labour Protection – National Research Institute

P5. Conceptual Directions in Uncertainty Quantification

Speaker: Michael Beer, University of Liverpool

P6. A unified model of dependability and resilience for complex systems

Speaker: Lech Bukowski, Academy of Business in Dąbrowa Górnicza

P7. Information Technology and Telecommunications: Mathematical methods for Multi-State System investigation

Speaker: Elena Zaitseva, University of Zilina

P8. Foundations of risk and reliability assessment and management

Speaker: Terje Aven, University of Stavanger

The presentations are available at the web site:
<http://www.esrel2014.org/presentations/>



Photo 3. The SSARS Panel discussion



Photo 4. ESRA TC Session: "Black swans..."

The program contained also two panel sessions of Summer Safety and Reliability Seminars SSARS 2014 and two workshops: ESRA Technical Committee on Foundations of Risk and Reliability Assessment and Management Session: "Black swans: are we equipped to assess and manage them?" and ESRA Risk Management Technical Committee Meeting on Visualizing Risk.



Photo 5. Welcome Reception

There was also provided a remarkable Social programme for Accompanying persons. The main social events contained the guided walking tour from the Congress Centre, through the Cathedral Island to the Market Square, visiting one of the most famous sights in Wrocław - the Panorama of the Battle of Raclawice,

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visit in Jaworek vineyard, where there was planned to visit wineries and cellars, and finally the performance in Opera in Wrocław: Samson and Delilah.

The annual European Safety and Reliability Conference ESREL stems from a European initiative merging several national Conferences into a major yearly conference under the auspices of the European Safety and Reliability Association (ESRA). The total number of registered conference participants was about 350, and covered 6 continents (Fig. 4-5). The last conference participant registered himself on 18th September, 2014.

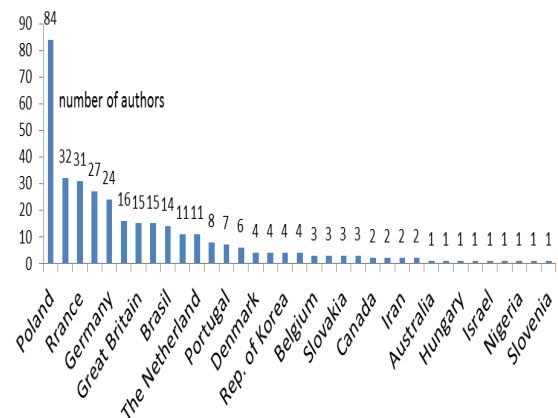


Fig. 4. Authors distribution by countries (total 346).

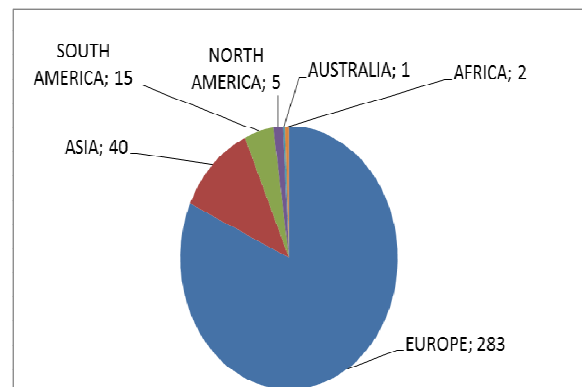


Fig. 5. Authors distribution by continents (total 346).

We thank all the Participants for their substantive contribution and valuable comments that gives the opportunity to exchange the ideas in defined fields of research and applications. Moreover, we encourage them to see the conference photos which are available at the web site: <http://www.esrel2014.org/photos-sunday-september-14th-2014/>.

We also invite all for the next ESREL 2015 Conference, which is going to be organized on 7-10 September 2015, in Zurich, Switzerland.

Calendar of Safety and Reliability Events

10th International Conference on Digital Technologies 2014 Zilina – Slovak Republic 9-11 July, 2014

The Tenth International Conference DT 2014 is the annual event that is held in Žilina traditionally. The aim of the conference is to bring together researchers, developers, teachers from academy as well as industry working in all areas of digital technologies. The conference makes is focused on a wide range of applications of computer systems. Topics of interest include:

- Reliability analysis and risk estimation
- Testing and fault-tolerant systems
- Accident and incident investigation
- Human factor
- Risk and hazard analysis
- Software reliability

The two Workshops in framework of the conference will be organized:

- International Workshop on Biomedical Technologies
- International Workshop on Reliability Technologies

Important dates

31 March, 2014 - Full paper submission
5 May, 2014 - Paper acceptance notification
30 May, 2014 - Camera-ready papers
30 June, 2014 - Final program

All submitted papers will be reviewed by Program Committee members. Accepted papers will be published in conference proceedings (CD-version under an ISBN reference).

Secretariat

DT'2014 Organizing Committee
Department of Informatics / University of Zilina
Univerzitná 1, 01026, Zilina, Slovakia
dt@fri.uniza.sk

Conference Website: <http://dt.fri.uniza.sk>

24th European Safety and Reliability Conference - ESREL 2014 Wroclaw, Poland 14-18 September, 2014

The XXIV edition of the conference, ESREL 2014 will provide a forum for presentation and discussion of scientific works covering theories and methods in the field of risk, safety and reliability, and their application to a wide range of industrial, civil and social sectors and problem areas. ESREL 2014 will also be an opportunity for researchers and practitioners, academics and engineers to meet, exchange ideas and gain insight from each other.

The conference will be hosted by the Congress Centre at the Wrocław University of Technology.

Important dates

26 January, 2014 – Submission of abstracts
31 March, 2014 – Submission of full length papers
30 May, 2014 – Early bird registration

Secretariat

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50-370 Wrocław
Poland
Phone: +48 71 320 2817
Phone: +48 71 320 3817
Fax: +48 71 328 2546
Mail: info@esrel2014.org

Conference Website: <http://www.esrel2014.org>

7th International Conference Workingonsafety.net **Learning from the past to shape a safer future** Scotland, UK, 30 September – 03 October 2014

Workingonsafety.net is an international network of decision-makers, researchers and professionals responsible for the prevention of accidents at work. The network attracts researchers, regulators, inspection bodies, safety professionals and other experts in this field of research and policy-making. It consists of an Internet platform (www.workingonsafety.net) and a biennial conference).

The organizing committee of the 7th conference invite to Scotland, United Kingdom. The hosting

organization is the Institution of Occupational Safety and Health (IOSH), based in Leicestershire, England. Abstracts should be submitted electronically through the conference website, www.wos2014.net.

Important dates

January 31, 2014 – Abstract Submission

Mid March, 2014 - Notification of Acceptance

June 15, 2014 - Full Paper Submission and end of early registration

August 31, 2014 – Deadline for the receipt of presentations

Secretariat

WOS Administrative Secretariat and National Organising Committee

Institution of Occupational Safety and Health

The Grange, Highfield Drive, Wigston, Leicestershire LE18 1NN, UK

Tel: +44 (0) 116 257 3378

mail: info@vos2014.net

Conference Website: www.wos2014.net

21st Advances in Risk and Reliability Technology Symposium (AR²TS 2015)

Leicestershire, United Kingdom
23-25 June 2015

The Safety and Reliability Society has been organising national, regional and local conferences and meetings for over thirty years. Following discussions with the organisers the Society is pleased to announce that it will now organise the bi-annual Advances in Risk and Reliability Technology Symposium (AR²TS) in 2015 and going forward.

The symposium will be an international forum for presenting and discussing recent advances made in the general area of reliability, risk, availability and maintainability. Contributions will be provided from both the university sector and from industry. It will be of benefit to both practitioners and academics involved in this field who want to keep in touch with the latest developments and perhaps through discussion, influence the future direction of work.

The AR²TS event, now in its 21st session, will take place on the 23rd – 25th June 2015 at Burleigh Court, Loughborough University. An initial call for papers has taken place but if you feel you have a paper or a poster to offer please contact the society via the contact details below.

Safety and Reliability Society's Chief Executive Officer Jacqueline Christodoulou said, 'This is a major

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opportunity for everyone involved in risk and reliability to come together at an international conference where cutting edge research meets industry innovation.

Contacts:

Phone: 0161 918 6663

Mail: info@sars.org.uk

Conference Website: <http://www.ar2ts.org.uk>

25th European Safety and Reliability Conference – ESREL 2015

Zürich, Switzerland

7 - 10 September 2015

The 25th edition of the European Safety and Reliability Conference, ESREL 2015, will be held at the Swiss Federal Institute of Technology Zürich (ETH), 7 - 10 of September.

Our ambition for ESREL 2015 is to advance in the understanding, modeling, and managing the risk, safety and reliability of systems in our increasingly complex world. We will set up a multidisciplinary platform to address the multiple aspects characterizing these fields of research and applications. With the support of the ETH Risk Center (<http://www.riskcenter.ethz.ch/>), we engage in broadening the scope of risk, safety and reliability analyses from the technical to natural, financial and social complex systems, focusing on interdependencies of functions and cascading failures. To better emphasize these topics, we will introduce new special areas, along with the traditional methodology and application areas of ESREL:

- Understanding Complexity in Socio-Technical-Economic Systems
- Modelling Interdependencies and Cascades
- Risk Approaches in Insurance and Finance Sectors

We also encourage the organization of other special technical sessions addressing the current hot topics of our fields.

We look forward to seeing you in Zürich!

Important dates

15.01.2015 - Abstract submission

15.04.2015 - Paper submission

31.05.2015 - Early registration

Conference Website: <http://www.esrel2015.org>

24th International Conference Nuclear Energy for New Europe

Portorož, Slovenia,
September 14-17, 2015

Coordinator: Igor Jencic

Important dates

April 30, 2015 - Abstract Submission

June 21, 2015 - Abstract Acceptance

August, 2015 – Submission of Full-Length paper

Conference Website: <http://www.nss.si/nene2014>

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: Englisch

Conference Chairs:

Edoardo Patelli, Institute for Risk & Uncertainty, UK
Ioannis Kougiumtzoglou, 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
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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>

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 à 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 Produção 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
- Università di Bologna (DICMA), Italy
- Politecnico di Milano, Italy
- Politecnico di Torino, Italy
- Università Degli Studi di Pavia, Italy
- Università 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
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- Universidad Politecnica de Madrid, Spain
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