European Safety and Reliability Association

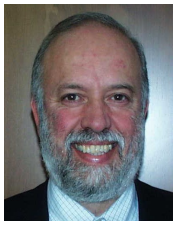
Newsletter

http://www.esrahomepage.org

September 2004

ESRA NEWS

Letter from the Chairman



Carlos Guedes Soares

IST – Portugal

I have the pleasure of announcing that Elsevier is offering personal subscription prices of the Reliability Engineering and System Safety Journal at much reduced rates to ESRA members of Technical Committees.

The offer comes in recognition of the fact that the Reliability Engineering and System Safety Journal has been the main scientific journal where results produced by ESRA members have been published. Indeed, since 1992, the Journal has been displaying the support of ESRA in its pages. This obviously does not imply that the scope of activity of ESRA is limited only to this Journal and in fact there are several others in the same general area that are very relevant and to which ESRA members regularly contribute with their research results.

The ESRA Technical Committees are an important asset of ESRA where active members join efforts to promote the advance of various specialist areas. The possibility of members of these committees to have access to this Journal at reasonable rates will certainly facilitate their contact with current research results.

I hope many members can benefit from this initiative and also that it can be an incentive for new members to join and actively participate in the work of the ESRA Technical Committees.

Agreement between ESRA and the Reliability Engineering and System Safety Journal

After a lengthy process, an agreement has been reached with Elsevier to offer personal subscription of the Reliability Engineering and System Safety Journal to members of the ESRA Committees. The edited text of the offer from Elsevier is enclosed here.

Reliability Engineering and System Safety, which is already published in association with ESRA, will be available for special member discount subscriptions subject to the below terms and to final agreement from Elsevier:

1. Individual ESRA members will be eligible for a special personal subscription rate of 122 Euro p.a. (For your information the full price subscription for 2005 for *Reliability Engineering & System Safety* will be about 3350 Euro)

These copies would be for the members' personal use only and we would ask yours members to:

- demonstrate individual membership of ESRA (Individual membership means the persons are part of a Technical Committee or Working Group, or the

Editorial Board of the ESRA Newsletter, and are mentioned in person on the ESRA web pages. Members of the Conference Committee may be eligible if their application has been signed off by the current year's Chairman of the Conference Committee).
- supply full mailing address for the subscription copy and when this changes inform the Publishing Editor of the journal
(If an individual member retires during the subscription year from a Committee, they may continue subscription to the journal at an individual member price until the end of the calendar year. If an individual member is appointed to a Committee during the year they are entitled to the full calendar year subscription at the individual member discount price.)
- undertake not to pass their copies on to any library or general reference source
2. The price for the individual members' issues would be revised annually after consultation with ESRA and fixed by June of the preceding year.
3. The minimum number of subscription is 4. If the number of subscriptions falls below 4 the publisher may cease this agreement.
4. Members of ESRA would be encouraged to submit suitable papers to the journal for publications. These submissions could be made through an ESRA Editorial Board member and will be subject to the same process of review as other papers.
5. ESRA may propose or be invited to develop special issues of the journal in collaboration with the Editor-in-Chief or Editor.
6. Editorial Board members of the Journal will each receive a gratis subscription to the journal.
7. Elsevier will mail copies of the journal to qualifying ESRA members by air-speeded post free of charge.
8. Elsevier would develop and maintain records of qualifying individual ESRA members and arrange to invoice them individually at the membership price. Elsevier would apply its normal policy in respect of unpaid invoices and reserve the right to cancel a subscription.
9. ESRA would assist Elsevier in ensuring that only qualifying members receive the special price subscriptions. ESRA would undertake to check a list of subscribers on request from Elsevier.
10. This agreement does not change the agreement between the journal and ESRA for the journal to be published in association with ESRA.
11. ESRA, in collaboration with Elsevier will undertake to inform its individual members of the availability of the individual member submissions discount.
12. The Agreement would run for three years (probably from Volume 87/1, the first of 2005), and will be renewed annually automatically unless either party submit a written termination of agreement 6 months prior to the end of the calendar year.

Isabelle Kandler

Publishing Editor, Elsevier

In Memory of Mauro Pedrali

When a real friend leaves you, whether for a short time or even a long time, a part of you leaves as well. The reunion is then joyful as you have regained what was lost and you can share mutual experiences and new knowledge.
When a real friend leaves you for good, then you are left with the past to look at and all common experience and collaboration. The richer the experience the greater the memory that one has of such a friend.
This is the case of Mauro for many of us.
Mauro left us, and the event has touched us naturally because his death was very premature. But what he left was a strong impact on all those that he met, because of his humanity and friendly attitude above all. He was a talented scientist and the combination of personal attitudes and professional quality made him special.
Professionally, he was one of the major Human Factors experts in the domain of aviation transport safety, including human reliability assessment, accident investigation and data basis, human errors analysis and classification. He had a substantial scientific experience in human-computer interaction and cognitive engineering. These were coupled with deep knowledge in training simulator, distance training, cost-benefit analysis of safety measures, multimedia application to simulation and system modelling.
He graduated in Aeronautical Engineering in 1993 at the Politecnico of Milano and continued his studies to obtain a Ph.D. in Computer Science at the University of Toulouse 1 in 1996.
Both his Theses, at graduation and Ph.D. level, focused on the issues of Human Factors in aviation and transport in general. This is when he developed the feeling and passion for the subject, which never left him. I had the privilege of following directly his graduation thesis and Ph.D. work. I am pleased to say that I contributed to generating his enthusiasm for Human Factors. He worked with me at the Joint Research Centre of the European Commission in Ispra following his doctorate, from 1997 to 2001.
As engineers, we managed to sustain the pressure from the two mighty sides of modern Cognitive Science, i.e., the engineering pragmatic conviction that without good and consolidated data and computable systems it is not possible to "calculate" anything especially human performance. And the other side, the psychology axiom that it is absolutely impossible to model or predict human behaviour. And we succeed in getting our views through to the scientific world. The publications that resulted from

the work of Mauro in those years and the successful participation to important European funded Research actions are testimonial of his ideas and valuable scientific work.
Unfortunately, he then had to leave the "joint research centre" of Ispra. That was a separation that impoverished our Human Factors group at Ispra.
But he did not leave Research. He found a new job that allowed him to continue his activity in Human Factors in the academic environment, while implementing his views and expertise in practical industrial environments. He held courses at the Politecnico of Milano while working for a private consultant in Genova, where he was leading and successfully promoting European Funded projects and research.
And we would have been working together again in these Projects, as we were partners in the last endeavour that he started, successfully proposed and developed actively up to his last days.
Thank you Mauro, we will not forget you. Your work and research findings will accompany us all the time, until we meet again.

Carlo Cacciabue
JRC Ispra

CONTRIBUTIONS FROM ESRA TECHNICAL COMMITTEES

Systemic Failures, Emergent Properties and the Management of Systems Engineering

C. W. Johnson
University of Glasgow, U.K.
Chairman, ESRA Technical Committee on Accident and Incident Modelling

We are in the early stages of establishing an ESRA Technical Committee in the area of accident and incident reporting. These activities are central to the development of safety-critical systems because they provide important feedback on the actual adverse events and near miss incidents that are often implicitly referred to within the products of risk assessment. Accident reports provide graphic illustrations of the rare worst case events that often form the focus for techniques, such as fault tree analysis. Incident reports and near-miss occurrences provide a richer repository of statistical information that can be used to validate estimates of likelihood, for instance in FMECA. The recommendations developed from incident and accident reports can force substantial revisions to previous risk assessments. The EC Seveso Directive arguably provides the greatest illustration of the impact of these adverse events. However, accident and incident analysis is complex. Individual and group bias can affect the findings of particular investigations. The complexity of many productions processes and the widening scope of investigations, to include both engineering and management issues, can frustrate the analysis of adverse events.

The development of accident and incident investigation techniques has been sporadic. The 1970s and early 1980s saw many new ideas stemming from, amongst others, the US Department of Energy and the National Transportation Safety Board. These ranged from Johnson's Management Oversight and Risk Tree through to Benner's Multilinear Events Sequencing techniques. The focus was often on the team based analysis of adverse events. The techniques themselves were intended to increase consistency by guiding the analysis of an incident so that all investigators considered the same range of possible causes. Other techniques provided more flexible approaches and instead focused on documenting the events leading to a failure. Even if investigators could not agree on why an incident occurred, they could use these approached to model what happened.
The pioneering work of these individuals was not sustained and the late 1990's saw a renewed interest in investigation techniques. Ladkin in Bielefeld began to develop more formal theories of causation in accidents and incidents. His Why-Because Analysis built on earlier event-based models by providing mathematical techniques for proving that particular causal relations led to an accident. Simply because event A occurs before event B does not imply that A caused B. In addition, Ladkin introduced a counterfactual test requiring that if A had not happened then B also would have been avoided. The contribution was clear; investigators now had to be far more careful in distinguishing between root causes and contributory factors. At this time, Leveson at MIT began to move her focus from software and safety critical systems design to the systemic causes of failure. She rejected previous event-based models and instead argued that investigators should look at the violation of constraints that were supposed to hold between system agents and components. Her work was closely tied to 'systemic' theories of accidents and failure as a complex emergent property associated with interactions between simpler components.

Here in Glasgow, the focus has been somewhat different. For instance, most of our work has questioned the benefit of systemic theories and emergent behaviors. We have recognized that many of the individuals involved in the engineering and management of complex systems are aware of the potential causes of an accident before they occurred. For example, the problems of foam strike were documented prior to the loss of Columbia. Similarly, the guage corner cracking that led to the Hatfield rail

crash was well understood. The problems of positive void coefficients were, at least in principle, understood before the Chernobyl accident. Hence, we would argue that these accidents did not emerge in some semi-mystical manner from the complex interactions between simpler components. Most often they were the result of known phenomena that had not been adequately recognized prior to the accident. There is also a danger that management will use 'systemic' theories to explain adverse events in which they are involved. For example, Joseph Berardin, the former CEO of Arthur Andersen, the auditors of Enron, commented that the collapse was not simply a business failure but "a systemic failure".

The key issue for the future is not to prove or disprove that systemic failures exist but to welcome the relatively recent resurgence of interest in accident and incident investigation. The conflicting approaches and alternate views reflect a healthy debate in an area of immense importance for the development, operation and regulation of complex, safety-critical systems. The liveliness of this debate is reflected in the growth of several workshops and conferences. For example, Peter Ladkin's group have promoted the Bieleschweig Workshops.

Others, including Michael Holloway at NASA Langley, have promoted the IRIA meetings. It is important also to stress the role being played by key individuals within investigatory agencies. In particular, Barry Strauch who is head of human performance in the NTSB and Marcel Ayeko at the Canadian TSB have done much to support and sustain recent research in these areas.

It is important to balance these more positive signs against the wider picture. Most academics have little interest in the analysis of failure and prefer to focus on new and more complex design techniques. Many commercial organizations would prefer not to invest in 'leading edge' incident analysis methods, fearing that this carries an implicit message of failure. Incident and accident investigation should be a central concern for risk assessment and analysis. Unfortunately, this is not reflected either by commercial practice or by academic involvement. For example, the range of journal papers on increasingly complex mathematical models for reliability centered maintenance dwarf the smaller number of articles that address the problems of obtaining accurate data to drive these models. Other areas warrant far more attention than they currently achieve. For instance, it is almost impossible to obtain reliable figures for the proportion of road traffic accidents that might be caused by vehicle microprocessor or software failures. Society is not at present, adequately equipped to distinguish these events from the more usual causes of driver inattention, weather conditions, road layout etc.

In consequence, it is unclear how we can even begin to estimate the risk of these incidents in the new generation of fly-by-wire vehicles.

If you are interested in helping to set up the ESRA Technical Committee on incident and accident reporting then please contact me via the URL given below.

http://www.dcs.gla.ac.uk/~johnson

FEATURES

Perspectives in Technological Disasters Management in Romania

Alexandru Ozunu

Regional Center for Major Industrial Accident Prevention, Babes-Bolyai University, Romania

The paper presents a brief summary of the actual activities of the Regional Center for Major Industrial Accident Prevention (CRAIM) in the context of the Seveso II Directive implementation in Romania. The discussions stress the need for networking in a Euro-Mediterranean synergy for the prevention and preparedness of the major technological disaster dealing with dangerous substances.

Introduction

The requirement to have a major accident policy is a new duty imposed on operators of establishments in Southeast Europe (SEE) that come within the scope of the Seveso II Directive. The necessity of the implementation of a Risk Management Program in accordance with a dedicated law is a priority for countries in the enlargement process, like Romania. Companies need to take inventory of their current operations to determine exactly what they have to communicate about the existing risk in the operating plants on human health and the environment. SEE countries have to face challenges and problems of ever increasing dimension and complexity from a wide range of potential disasters and emergencies arising from technological hazards. Human communities that are near the great industrial platforms are influenced dramatically because of air and water pollution and soil degradation. Two problems have to be urgently addressed:

- Risk assessment and recovery strategy for polluted sites
- Risk analysis and management for technological hazards.

The answer to the two problems share most risk related methodologies, IT tools and data sources, so they can be dealt with in a synergistically co-ordinated way. Within the scope of the activities that must be carried out are information, documentation, training and dissemination. Under the Romanian Governmental Programme Framework MENER, a new project, a Regional Center for Major Industrial Accidents Prevention (CRAIM), is in process. Its key point is to establish links with existing European Countries Networks to establish synergistic and

compatible regional information systems for supporting national authorities in the management of risk and emergency situations due to technological hazards. Some arguments are: candidates countries' scientific literature is very poor in this domain; there are no specific national guides and methodologies for the qualitative and quantitative assessment of risks and disasters management; the methodologies used for making emergency plans differ and there is no unique, integrated plan which may correspond to a unique service of emergency for the administration of crisis situations in the case of technological disasters; and the population's "right to know" - to be informed continually and correctly informed regarding the technological risks in the local communities is poorly worked out or non-existing. This Project meets priority SEE needs as identified in the "Draft of strategic of prevention and readiness for disasters in SEE", which was adopted on the session in Geneva, on 26 and 27 June 2001.

In CRAIM functions a virtual laboratory (EIRM) for assessment of the impact of risk factors over the environment. The virtual laboratory is endowed with the apparatus and the software that are necessary for the development of some specific applications, e.g. chemical dangerous gas pollution (chlorine, ammonia) from a plant in work, accidental pollution of water and soil, the simulation of some accidents in transport, manipulation and storage of dangerous substances, the residual risk assessment in old industrial plants, the residual risk assessment in old technologies, explosions, fire etc.

CRAIM's main objectives:

- Educating and training experts for assessment and management of technological risks
- Setting up and maintaining of databases concerning the operators which have major technological risks
- Development of new models and methods for assessment and management of risks and technological disasters
- Prevention of technological accidents with dangerous substances
- Development of scientific and technological research in the field of environmental protection
- Leading up programs which are necessary to realize the specific politics in the risk area
- Integrating the organization in an international framework

The impact of time delay and technological disaster management in SEE countries

The Seveso directive (SD) was introduced in EU countries in 1982. The SD II implementation in member states ended in November 1999. In these two decades many activities related to safety issues have been carried out. Learning from the experience gained in Western countries confers to SEE countries a major advantage in the implementation process. Some steps should be done very quickly. Also, the amount of the information and scientific literature in this field ('Loss Prevention') has increased dramatically over the years, and time delay only increases the present hiatus in knowledge. It is therefore very important to quickly connect all the representatives of the various SEE countries into a network dealing with safety fields.

In Romania, the industrial pollution control and risk management acquis is following EC Directives: 96/61/EC concerning integrated pollution prevention and control (IPPC), 96/82/EC of 9 December on the control of major-accident hazards involving dangerous substances (SD II), Council Regulation (EC) N^{o} 1980/2000 on a Community eco-label award scheme, 2000/40/EC establishing the ecological criteria for the award of the Community eco-label to refrigerators, Commission Decision 2000/45/EC establishing the ecological criteria for the award of the Community eco-label to washing machines.

The Romanian inventory of the activities and installations falling under the Directive's provisions

The identification methodology of the installation using hazardous substances was established and their inventory was made on that basis. The total number of the inventoried economic units at national level is 623. Out of these, the following classes were identified:

-245 economic units posing *major risk* of accidents (39.3%);
-88 economic units posing *minor risk* of accidents (14.1%);
-290 economic units posing *no risk* of accidents (46.6%).

Conclusions

The risk-based approach to environmental management is built around the following major themes: a scientifically based risk assessment is essential for environmental decision-making, the public must be involved in the risk assessment and management processes; resources should be focused on problems where the greatest risk reduction can be achieved; environmental regulations should be performance-oriented and allow risk reductions in the most cost-effective manner.

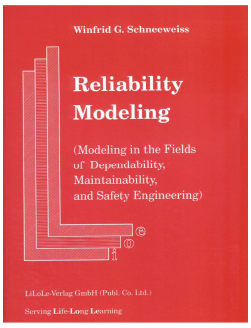
The requirement to have a major accident policy is a new duty imposed on operators of establishments in Southeast Europe (SEE) that come within the scope of the Seveso II Directive. The necessity of the implementation of a Risk Management Program in accordance with a dedicated law is a priority for countries in the enlargement process, like Romania.

Companies need to take inventory of their current operations to determine exactly what they have to communicate about the existing risk of their plants to human health and the environment. It is difficult to argue before an EPA or the public that a particular plant poses no significant industrial hazard and risk when no one has ever assessed its level of risk.

By successful realization of the CRAIM Project, the level of preparedness and, implicitly, level of protection from technological disasters in Romania and in the region would be highly improved. Such

improvement will not only benefit SEE countries, but, because pollution does not stop at national borders, all of Europe.

BOOK REVIEW



Reliability Modeling, by Winfrid G. Schneeweiss, LiLoLe-Verlag
Hagen, 2001

The author starts the preface by indicating that the book is written mainly for the practicing engineers who are occasionally confronted with reliability problems and who wish to understand the matter of reliability modelling a little deeper than just run a CAD tool on the computer and that this is also useful as a university book. I would agree although I see it more as a good support textbook.

The book has a Part I with reliability modelling according to the number of system components and a Part II as an appendix with the mathematical foundations of reliability/dependability modelling.
Starting with Part II, it covers the basic vocabulary of graph theory and the basic theory of Boolean algebra and functions, of probability calculus, of Laplace transform and of renewal processes. As it suggests, this appendix reviews the required material for following the book presentation based on analytical approaches with Boolean formulations, which however is not so condensed as to make life too difficult for the reader not too familiar with Boolean formulations.

Part I deals with reliability modelling for the single components and for systems of 2, 3, 4 and 5 and with systems with many components, each in a separate chapter.

It considers the component with periodic preventive renewals and with periodic checks and discussed the general case of the repairable unit and the Markov approach to its modelling. It then discusses special missions such as intermittent deterministic demands and sporadic demands of short duration.

For systems of two components it discusses non-redundant and redundant systems and presents stationary and non-stationary solutions to Markov models of 2 components. It the deals with 1-out-of-3 and 2-out-of-3 systems, discussing cold and hot standby and the Markov model. The following chapters deal with a similar approach to systems of 4 and 5 components discussing also the borderline of hand calculations.

Two chapters are dedicated to systems with many components discussing general problems, approximations and connectivity problems in graphs. It mentions large series/parallel systems and m-out-of-n:G systems discussing how to handle the respective Fault Trees.

The following chapters return to the single component and to more components to deal with more involved aspects of reliability modelling. It discusses availability, the effect of random renewals and inspections of units. The models of queueing systems and Petri Nets to describe repairable systems are also discussed.

Finally all chapters have a list of proposed exercise and at the end of the book solutions are provided. Normally books do not provide solution of exercise and this is a very interesting feature that makes the book more easily usable for self-study.

So, overall the book is an interesting contribution that concentrates on analytical formulations applicable up to "the borderline of hand calculations" and this is a good supplement to the use of a "CAD tool" as the author calls them. Indeed many practical problems that need to be solved involve a small number of components and this book can be useful for those cases. For industrial situations more complex computer based systems are required but the understanding provided by the material of this book should allow the comprehension of the results of such analysis. In addition, students have to start with simple cases that can be troughly analysed and understood before moving to very complex ones. Therefore, this book clearly fulfils these two aspects and thus is recommended for that purpose.

Carlos Guedes Soares
Instituto Superior Técnico, Portugal

SAFETY AND RELIABILITY EVENTS

Lars Bodsberg
President ESRA – Norway

ESRA–Norway

Last year activities

ESRA-Norway has 345 individual members and 21 company members. Last year ESRA-Norway hosted 7 seminars on the use of risk and reliability methods. Some of the seminars were video meetings, and the number of participants varied between 20 and 50. The seminar topics have been:

- Barriers? Indicators? Risk acceptance criterion? How safe is safe enough?
- Reliability and safety of new railway system;

- Barrier analyses. Experience from Swedish nuclear industry and offshore production;
- Human factors and safety;
- Emergency preparedness;
- Hydrocarbon release frequencies in offshore production;
- Safety challenges during acquisition of trains.

10th- year Anniversary

The Norwegian Risk and Reliability Association (ESRA-Norway) celebrated a 10 year anniversary by hosting an annual meeting and a two-day seminar in May 2004: "The use of risk analyses and the future of HSE". The seminar addressed

- ethical dilemma
- use of risk analysis during organizational changes
- experience and perspectives on the use of risk analysis in various business sectors.

Dr. Jop Groeneweg, Universiteit Leiden, presented a very interesting key lecture on the future of safety management, violation management and safety culture.

The feedback by the 65 seminar participants indicated that the seminar was very successful from a professional as well as social point of view.

Odd Tveit

Honorary Member of ESRA Norway

Mr. Tveit was appointed honorary member of ESRA–Norway at the Annual Meeting in 2004. Tveit was one of the founders of ESRA-Norway, and has worked on risk and reliability studies for more than 40 years. Since the early eighties he has worked as safety engineer and chief engineer at the Norwegian petroleum company Statoil. He still provides professional knowledge to the company at the age of 71!

Tveit is one of the founders of the two recognized databases "The Worldwide Offshore Accident Databank" (WOAD) and "Offshore Reliability Data" (OREDA). He has played a very significant part in the Norwegian research and development into fire and gas explosions, risk acceptance criteria and risk analysis methods.

Loss Prevention and Safety Promotion in the Process Industry

Zoe Nivolianitou

National Centre for Scientific Research 'Demokritos', Greece

Preface

Loss Prevention and Safety Promotion in the Process Industry is a series of symposia organised in various European cities. The year 2004 is the 30th anniversary of the origin of the series of Loss Prevention Symposia held triennially as events of the European Federation of Chemical Engineering initiated by the EFCE Working Party on Loss Prevention and Safety Promotion in the Process Industries. The Loss Prevention Symposium is worldwide recognised as one of most important meetings on Safety Promotion in the Chemical and Process Industries. The Symposia bring together representatives and engineers from industry and research, engineering and consulting organisations, universities and authorities.

This year the Loss Prevention 2004 Symposium has been held in the Prague Congress Centre, the Czech Republic, a new member of the European Union.

The symposium has matched the meeting of professional colleagues in a scientifically interesting event while enjoying and visiting historical monuments of Prague.

Technical Program Structure

The Symposium has been structured into 3 days held mostly in 5 Parallel Thematic Sections.

There have been 4 different Forms of Paper Presentation:

- PL Plenary Lectures -total 6 Plenary Lectures have been presented by invited speakers.
- Lectures - Full Oral Presentations have been presented in the 5 Thematic Sections.
- Short (Brief) Oral Presentations have been scheduled in all 5 Thematic Sections like Lectures.
- Posters - Posters only/solely. Some Papers have been presented as Posters only.

A special Discussion Meeting has been also held on the outcomes of the EU funded PRISM Project aimed at sharing best practices in Human Factors.

Last, a co-operative effort with the EFCE WP on Environmental Protection and Sustainable Development has been focused on overlapping joint matters.

Technical Exhibition

Loss Prevention 2004 Technical Exhibition has operated throughout the Symposium. The Exhibition has been a good opportunity for Companies to demonstrate their activities, software support services, equipment and instrumentation for the promotion of safety in chemical and related process industries.

Symposium Materials

Symposium Proceedings -Paper Full Texts of both Lectures and Posters have been issued on CD ROM and have been handed over to all participants on arrival together with printed Abstracts. Copies of CD ROM, and of printed Abstracts can be ordered from the organisers.

Survey of Parallel Thematic Sections and Included Topics

Loss Prevention Symposium Topics

1. Risk Assessment: Identification, Quantification and Evaluation Methods. Economics, Cost- Benefit Analysis. Domino Effects.

2. Risk Reduction: Intrinsic Safety. Dependability of Plant. Risk Based inspection. Automation and Control
3. Safety, Health and Environment in Projects at Research, Design. Engineering, Construction and Operating Stages. Safe Procedures for Plant and Process Modifications
4. Optimisation of Safety, Health and Environmental Measures with Business Performance
5. Integrated Safety, Health and Environment Management Systems. Protection in Small and Medium Size Enterprises. Performance Indicators and Metrics
6. Safety aspects of Environmental Measures and Sustainable Development
7. Legislative and Industry Initiatives. Implementation and Impacts. Land Use Planning
8. Hazardous Properties of Substances and Materials. Advanced Test and Classification Methods. Acute and Chronic Toxicity and Ecotoxicity.
9. Accidental Releases and Consequences. Modelling and Simulation, Computational
Methods. Prevention, Protection, Control and Mitigation
10. Dangerous Goods Handling, Storage and Transportation
11. Risks from External Impacts -Aircraft, Ships etc, Natural Hazards-Floods, Earthquakes etc. and Terrorism Security
12. Learning from Experience. Case Studies, Incident Investigation and Analysis. Lessons Learned Systems
13. Emergency Response. Awareness, Preparedness and Crisis Management
14. Human Factors: Behavioural Improvement and Team Working. Optimising Human Performance. High Demand Situations-Control Rooms and Emergencies. Ergonomic Design.

Attendance

The participants were about 200 hundred coming from all European countries but also form outside Europe with heavy participation of the local scientists and authorities. The audience was very interested in the presentations while the facilities and reception has been of high standard. The social program has been equally acclaimed allowing participants to meet each other in a relaxed and informal way, enjoying the suggestive environment of the Czech Capital.

CALENDAR OF SAFETY AND RELIABILITY EVENTS

Advances in Reliability Technology Symposium - 16th ARTS

12th-14th of April 2005

Loughborough University, UK

Conference Website
http://www.lboro.ac.uk/arts

QUALITA 2005 - Quality and Dependability (RAMS)

5th Multidisciplinary International Conference

16th – 18th of March 2005 - Bordeaux, France

Conference Website:
www.lap.u-bordeaux1.fr/qualita2005

International Conference on Structural Safety and Reliability ICOSSAR'05

19th-22nd of June 2005

Rome, Italy

Conference Website
http://www.icossar2005.com

ESREL 2005 – The European Safety and Reliability Conference

27th – 30th of June 2005 – Tri City, Poland
Conference Website:
http://esrel2005.am.gdynia.pl

ESREL 2006 – The European Safety and Reliability Conference

18th – 22th of September 2006 – Estoril, Portugal

ESRA INFORMATION

1 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
- The Danish Society of Risk Assessment, Denmark
- ESReDA
- French Institute for Mastering Risk, France (IMdR-SdF)
- ESRA Germany
- The Norwegian Risk and Reliability Association (ESRA Norway)
- SRE Scandinavia
- The Netherlands Society for Risk Analysis and Reliability (NVRB)
- Polish Safety & Reliability Association, Poland
- Asociación Española para la Calidad, Spain

1.3 Companies

- TAMROCK Voest Alpine, Austria
- ARC Seibersdorf Research GmbH, Austria
- VTT Industrial Systems, Finland
- Bureau Veritas, France
- INRS, France
- Total, France
- Commissariat á l'Energie Atomique, France
- GRS, Germany
- VEIKI Institute for Electric Power Research Co., Hungary
- Autostrade, S.p.A, Italy
- D'Appolonia, S.p.A, Italy
- IB Informatica, Italy
- TECSA, SpA, Italy
- SINTEF Industrial Management, Norway
- Central Mining Institute, Poland
- Transgás - Gás Natural, Portugal
- Companhia Portuguesa de Producção Electrica, Portugal
- Siemens SA Power, Portugal
- Caminhos de Ferro Portugueses, Portugal
- ESM Research Institute Safety & Human Factors, Spain
- IDEKO Technology Centre, Spain
- TNO Defence Research, The Netherlands
- HSE - Health & Safety Executive, UK
- Railway Safety, UK
- W.S. Atkins, UK

1.4 Educational and Research Institutions:

- University of Innsbruck, Austria
- Université Libre de Bruxelles, Belgium
- University of Mining and Geology, Bulgaria
- École de Mines de Nantes, France
- Université de Bordeaux, France
- Université de Technologie de Troyes, France
- Université de Marne-la-Vallée, France
- Technische Universität Muenchen, Germany
- Technische Universität Wuppertal, Germany
- National Centre for Scientific Research 'Demokritos', Greece
- Politecnico di Milano, Italy
- University of Rome "La Sapiensa", Italy
- Universita Degli Studi di Pavia, Italy
- Universita Degli Studi di Pisa, Italy
- Technical University of Delft, The Netherlands
- NTNU, Norway
- Gdansk University, Poland
- Gdynia Maritime Academy, Poland
- Institute of Fundamental Technological Research, Poland
- Technical University of Wroclaw, Poland
- Instituto Superior Técnico, Portugal
- Universidade de Coimbra, Portugal
- Universidade Nova de Lisboa, Portugal
- Universidade de Minho, Portugal
- University Politechnica of Bucharest, Romania
- University of Strathclyde, Scotland
- Institute of Construction and Architecture of the Slovak Academy of Sciences, Slovakia
- Institute "Jozef Stefan", Slovenia
- Universidad D. Carlos III de Madrid, Spain
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General Secretary &Treasurer

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Delft University of Technology, The Netherlands

3 Management Board

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3.1 Conference Standing Committee

This committee aims at establishing 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

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.

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ESRA is a non-profit international organization for the advance and application of safety and reliability technology in all areas of human endeavour. It is an "umbrella" organization with a membership consisting of national societies, industrial organizations and higher education institutions. The common interest is safety and reliability.

For more information about ESRA, visit our web page at http://www.esrahomepage.org.

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