European Safety and Reliability Association

Newsletter

http://www.esrahomepage.org

January 2005

ESRA NEWS

Letter from the Chairman

Carlos Guedes Soares

IST – Portugal

ESRA Book Series

ESRA has had since its beginning a Publications Committee and one of its aims has been the edition of an ESRA Book series but this has not materialised yet. However I am glad to inform that we have set the infrastructure for this activity to start in the future by reaching an agreement with A.A. Balkema Publishers who in the meanwhile became associated with Taylor and Francis.

Balkema has specialised in the publishing of Conference proceedings and they have been chosen in competitive bids to publish the ESREL proceedings in various years. The quality and timely delivery has always been appreciated and this motivated negotiations that we maintained with them for some time in order to have more extended type of publications in an ESRA Book Series.

The books contemplated are Proceedings, Monographs or edited volumes and textbooks. We are hoping to keep ESREL Proceedings systematically within this series to benefit from continuity. However this series of Proceedings is meant to cover also proceedings from other symposia and smaller workshops that may be promoted by the ESRA Technical Committees of by National Chapters. The restriction to publish such a book in the series will only be a bulk order of 100 volumes for the participants, which is often appropriate in smaller workshops.

I would like to see the series of ESRA proceedings expanding and I encourage ESRA members to use this series for the proceedings of their meetings. A special invitation is addressed to ESREDA, which normally organises two yearly workshops and, since they are ESRA members, they absolutely qualify to have the proceedings of these workshops in the ESRA series. Another special invitation goes to the National Associations and National ESRA Chapters who often promote workshops with proceedings in English, which could adhere to publishing in this series.

Monographs or Edited books are published without having any pre-publication bulk order, but here there must be an evaluation of the contents of the book and the interest for the wide readership.

Finally, Textbooks are encouraged and there is some flexibility to look for solutions to produce them at a low cost that may be easily accessible to students. The possibility of using paperback editions to make the price more attractive has also been considered, in particular when large orders are expected.

We would like to see this book series to grow as a major reference for the people that work in the field of Safety and Reliability and therefore we need also to be very careful to ensure the quality of the published material. The Proceedings of the Conferences and workshops will be based on refereed papers by a recognised Scientific Board, which have always been present in the ESREL Conferences, where publication is based on full paper review. The workshop proceedings to qualify for publication in this series will need to demonstrate the existence of a

recognised review board and of the implementation of a paper review process.

For monographs, edited books and textbooks there will be a Book Series Editorial Board, who will have the responsibility of reviewing the submitted manuscripts and ensuring the quality of the accepted ones. I will be acting as the Book Series Editor and will be inviting distinguished colleagues to serve in this board to cover the various disciplines.

The books published in this series will be sold to ESRA members at a discount of 35% of the retail price, which hopefully will make these books of easier access to ESRA members.

I hope that this initiative will open a new direction of activity for ESRA, which may prove beneficial to our associates and to the profession at large.

FEATURES

Reliability and Safety Analysis of Reinforced Concrete Containment due to High Internal Overpressure

Juraj Králik

Faculty of Civil Engineering
STU in Bratislava, Slovakia

Introduction

The International Atomic Energy Agency set up a program to give guidance [1] to its member states on the many aspects of the safety of nuclear power reactors.

One of the predominant criterion of the plant safety and reliability is to preserve the containment tightness against radiological release to environs in the case of the accident damage on cooling system.

The reliability of the plant structure depends on the reliability of all subsubstructures, which can cause the radiological leakage. Hence the reliability of the plant structure is determined of its segment resistance.

The concrete structures of hermetic zone were analyzed for number of situations, such as a LOCA (Loss of Coolant Accident) or a HELB (High Energy Line Break) or a SBLA (Steam Line Break Accident) on the different primary loop piping systems. On the ground of these results the reconstruction of the structures and technological equipments was realized. Considering the uncertainty of the loading and material properties of the structure the reliability of the containment was determined using probabilistic safety assessment (PSA) level 2.

Insight from these PSAs proved to be useful in identifying plant vulnerabilities in the area of containment performance and accident management strategies as well as providing a basis for plant specific backfit analysis and evaluation of risk reduction options.

The plant damage states (PDS) parameters selected for the Bohunice V1 level 2 PSA were chosen based on the review of previous studies [2, 3], in which the resistance of the plant structures has been checked for extreme steam pressure in the case of small or medium-sized accidents.

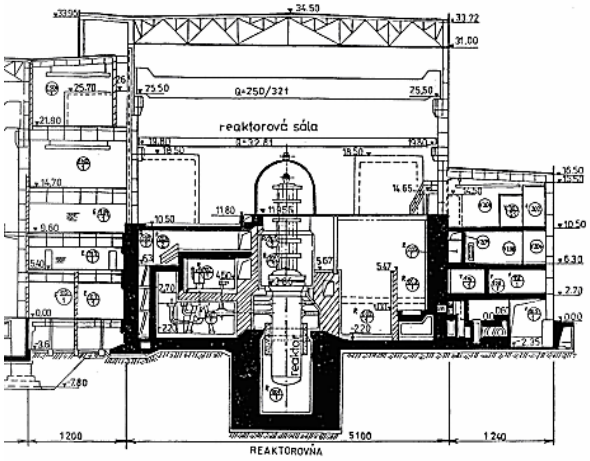


Fig.1 *Scheme of NPP building V1 in J.Bohunice*

The upgraded structures should be analyzed for number of situations and the subject of the present structural analyses was to locate the most critical structures in case of LOCA and to determine the best estimate value of the failure pressure which could cause intensive leakage at the critical plant area.

The PSA level 2 calculations were carried out to determine the probability of failure of the concrete structure under excessive internal overpressure.

Consequently even in a case of a PSA project the objective was not to find the mean failure pressure, but rather the probability of failure under an internal overpressure of definite value.

For a complex analysis of the containment structure under a various load cases, ANSYS 8.0 software and the program CRACK [3] (created by Králik) were provided to solve this task. The building of the power block was idealized with a discrete model consisting of 26 923 elements with 325 036 DOF.

Scenario for LOCA loads

The accident scenario was defined by SIEMENS KWU, VÚEZ Tlmače and VÚJE Trnava within the Phare program and "The NPP V1 Reconstruction Project". The thermodynamic experimental analysis of the cooling pipe system and the numerical simulation provided the input data concerning the load behavior over time [6].

The guillotine cutting of the ∅32mm cold leg in the CTMT (Containment) and the large break LOCA of the 2x∅500mm cold leg with ECCS (Emergency Core Cooling System) safety injection were considered.

The long-time effect of temperature (considered for the concrete creep and shrinkage after 20 years), the dead loads from structures and technology were taken constant for nonlinear analysis.

On the basis of previous investigations of VVER 213 reactor buildings, carried out in the USA, Slovakia and Hungary, the following critical structures were identified:

- hermetic doors
- reactor dome
- covers of locks (rectangle and circle)
- tube penetrations
- boundaries of the hermetic compartment (reinforced concrete structures and the steel liner) .

Comprehensive analyses have been performed on containment isolation and damage. Supporting thermal hydraulic and structural analyses were an integral part of the study. Source term analysis has been performed to provide quantitative data for radioactive releases. Comprehensive sensitivity analysis that addressed both the relevant modeling assumptions and potential plant improvements was also conducted.

Nonlinear solution of concrete cracking and crushing

From the comparison of containment structure resistance it follows that in the case of concrete and steel liner jointed effect the damage of structure is attained at 260 kPa and otherwise 220 kPa.

On basis of non linear analysis providing the monotone increases of overpressure in CTMT the critical points in structure were defined.

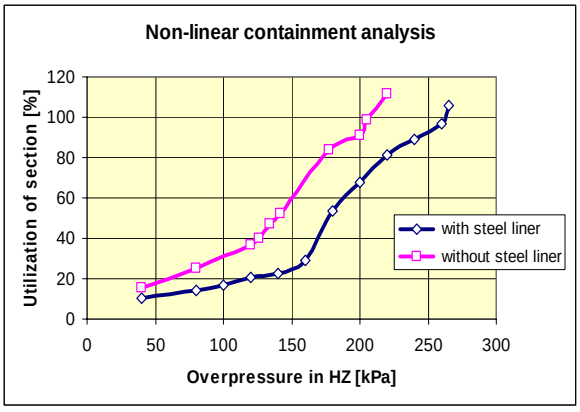


Fig.2 *The capacity of structure section depending of overpressure load in HZ (CTMT)*

Figure 3 shows the izosurface of principal deformations at TOP face of element (surface at positive face of element - normal element vector and global coordinate vector are identical).

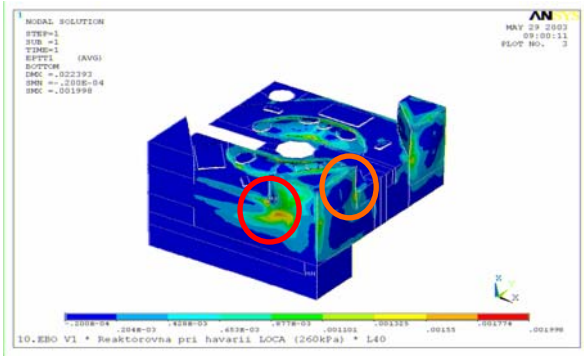


Fig.3 *Cross section of NPP building V1 in Jaslovské Bohunice*

Probabilistic analysis of containment structures

The methodology of probabilistic analysis of integrity of reinforced concrete structures of containment leads off requirements [1, 4, 5] and experience in their applications. In this report the direct simulation of the MONTE CARLO method is used to solve the reliability considering the non linear behavior of reinforced concrete structures [2, 3] under system ANSYS.

The probability of integrity loss of reinforced concrete structure is calculated from the probability of limit state violation $P_f = P(SF < 0)$. The limit state function *SF* is defined as SF = R / E -1, where *R* is the design capacity of structure, *E* the design load effect. The resistance of reinforced concrete structure is given by the condition of section integrity.

The probabilistic analysis of accident LOCA involves the uncertainties of material properties, load level, non linear calculation and design condition. On the basis of mentioned inaccuracy of input data for probabilistic analysis of integrity loss of reinforced concrete containment structures were determined their mean values and standard deviations, different variable constants for normal and lognormal distribution. Leading off from variability of input quantity 10^6 simulations in the method MONTE CARLO under system ANSYS were realized, on the base of which the probability of loss containment structure integrity CTMT is determined. Total uncertainty is presented with standard deviation value 8% and 17% using the normal probability distribution of containment failure.

The probability of containment failure can be defined as:

- discrete function from MONTE CARLO simulations in accordance to the results of nonlinear analysis,
- idealized function (Normal distribution) from the mean value of reliability function SF and standard deviation (8 or 17%).

The idealized cumulative function for normal distribution of the reliability function for 8% of

standard deviation is at very good agreement with behavior of the reliability function achieved from presented solution. For this case of probability distribution is the error factor equal to value 1,304.

Conclusion

The general purpose of the analysis of the containment integrity was to estimate the overpressure loads causing the structural collapse. The probability check of the structural integrity was realized for the critical places, which were defined from the previous nonlinear analysis for various scenario of LOCA loads [3]. The probability of the containment failure is equal to 8.10^{-6} for overpressure 200kPa and probability 1,0 for overpressure 300kPa considering the Kupfer's bidimensional criteria of the damage. In the case of the LOCA accident at 122,7kPa the probability is smaller than required 10^{-4} for design resistance.

References

[1] IAEA, Guidelines for VVER 440/213 Containment Evaluation, Rep. IAEA, March 1995.

[2] Králik, J., Experimental and Numerical Analysis of Reinforced Concrete Containment after Loss of Coolant Accident, In proc. The International Symposium on "Mechanics of Composites", October 14, 2002, Prague, Czech Republic, CTU in Prague, Klokner Institute, 2002, pp.91-98, ISBN 80-01-02621-3.

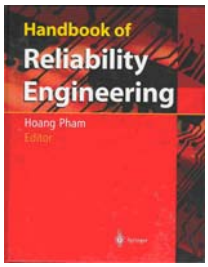
[3] Králik, J., Cesnak, J., Nonlinear Analysis of Power Plant Buildings with the VVER 230 Reactor after a Loss of Coolant Accident. In: Slovak Journal of Civil Engineering. STU Bratislava, Vol. 2001/3, pp.18-32.

[4] Králik,J., Probability Analysis of Reinforced Concrete Containment Integrity due to High Internal Overpressure, In proc.: 21 CAD FEM User's Meeting 2003, Berlin-Potsdam, November 12-14, 2003. pp.1.4.5.1-10 in CD, ISBN 3-937523-00-6.

[5] Lenkei, P., Györgyi, J., Probabilistic Structural Analysis of Nuclear Containment under LB LOCA. Rep.JE Paks. N-Quad Ltd, Pécs, Hungary, 1999.

[6] Rohár, M., PSA level 2 for V-1 Bohunice NPP. 500mm LOCA on cold leg with ECCS failure. VÚJE Trnava, Rep. no. 2749/00/02/2002.

BOOK REVIEW



Handbook of Reliability Engineering,

Hoang Pham (Editor)

The handbook "aims to provide a comprehensive state-of-the-art reference volume that covers both fundamental and theoretical work in the areas of reliability including optimization, multi-state system life testing, burn-in, software reliability system redundancy, component reliability system reliability, combinatorial optimization, network reliability, consecutive systems, stochastic dependence and aging, change-point modelling, characteristics of life distributions, warranty, maintenance, calibrate modelling, step-stress life testing, human reliability, risk assessment, dependability and safety, fault tolerant systems, system performability, and engineering management."

Organised into 35 chapters written by 45 experts in the relevant fields, this handbook gives a very broad overview into important areas within reliability. Each chapter describes a number of different models in use and many conclude with a discussion of open problems. All contain a long list of references to the scientific literature. Software reliability, maintenance and accelerated testing in particular get considerable attention.

As should be clear from the claim quoted at the start of this review, the Handbook is aiming to give a state-of-the-art review, rather than a fully comprehensive overview of everything. This means that some aspects which are basic reliability techniques, such as Markov modelling and FMEA are largely ignored. In fact these two techniques make a appearances in Section 5: Practices and Emerging Applications. There are a few odd bedfellows in this section which is – inevitably – the least coherent of the Handbook. Maybe the next edition of the Handbook could augment this section with some case studies?

My main concern with this book is that there is relatively little attention paid to aspects of statistical inference. For example the fundamental choice of classical or Bayesian paradigm is not discussed and data censoring only gets a few pages of text. It has been left to individual authors to pick out those bits of inferential statistics that they need, and while this is a perfectly valid and pragmatic choice it does mean that a coherent overview of modelling choices is not given. I also missed a couple of areas of reliability modelling, notably common cause failures and residual lifetime regression modelling.

As a conclusion though, this book is well worth getting as a reference volume in your library, and provides an excellent way of getting new researchers up to speed!

Tim Bedford

University of Strathclyde, Scotland

SAFETY AND RELIABILITY EVENTS

Workshop on Equipment Reliability at Nuclear Power Plants

23rd of October, 2004

UNESA, Madrid, Spain

Sebastián Martorell

Universidad Politécnica de Valencia, Spain

On October 23, 2004, a Workshop on Equipment Reliability at Nuclear Power Plants was organized jointly by Tecnatom, Endesa, EPRI worldwide and UNESA. The host of the Workshop was the general office of UNESA in Madrid, Spain. More than 50 participants came to a three days meeting to hear 20 speakers and take part in three discussion groups. The participation covered fourteen countries.

The motivation for the Workshop was the need of an improved reliability for Nuclear Power Plants as a consequence mainly of competition, which is putting pressure on utilities to ever improve performance while maintaining high standards of safety, and society, which has become less tolerant of failures at nuclear facilities.

The objectives of the Workshop were to examine current and future needs in technology improvements on equipment reliability, encourage lively discussions among participants and synthesize perspectives from Europe and US, use feedback from participants to promote a coordinated development program for enhanced monitoring and applications of equipment reliability, and foster high level of awareness and communication among participating organizations.

The Workshop structure consisted of a general session, three technical sessions that included 18 oral presentations, and three brainstorming sessions.

The general session included five presentations giving an overview of European and US equipment reliability and maintenance programs. These emphasized on efficiency and cost-control through careful evaluation of level of maintenance for any given type of equipment, operational/safety impact and duty, emphasis on reliability centered maintenance techniques and increased use of risk-informed approaches for In Service Inspection and In Service Testing. In addition, the presentations emphasized the importance of life cycle management programs, the increasing use of maintenance performance indicators and the increasing role of condition based maintenance.

Technical presentations and group discussions covered three main topics with active participation from the floor. The first technical session included six presentations on component maintenance guidance and experience, the second session included three presentations on equipment monitoring and diagnostic/condition based maintenance, and the third session included five presentations on plant equipment reliability and maintenance strategies.

The participants in the brainstorming sessions were divided into three groups with the aim at debating respectively:

1) component maintenance guidance and experience (green group),

2) equipment monitoring and diagnostic/condition based maintenance (blue group) and

3) equipment maintenance trends and strategy development (red group).

Key conclusions from the green group were that more on-line and condition based maintenance is needed, and reduction of the current volume of maintenance seems necessary.

The blue group reviewed recent condition based maintenance applications and their degree of success. A list of approximately twelve developments was proposed with the highest priority on the establishment of general criteria for maintenance optimization and practices to make good use of condition based maintenance in preventive maintenance. The red group identified and discussed future trends and most significant issues related with good use of information and available data, unexpected degradation of equipment and obsolescence.

The overall conclusions of the Equipment Reliability Workshop were as follows. Excellence in maintenance requires good technology, working organization and effective management. Equipment reliability/maintenance improvements go hand in hand with enhanced safety. Condition based maintenance is playing an increasingly more prominent role in advanced maintenance programs. Identified needs for better predictive and decision-making tools. Many technologies are available to support effective data gathering and processing, but significant technology gaps were also identified that should be addressed collaboratively.

The Workshop was concluded by a participated discussion on the conclusions arrived at during the meeting.

"Better, cheaper, faster"…. Which two would you like to have?

15th-16th of November, 2004

The Corinthian, Glasgow, Scotland

Tim Bedford

University of Strathclyde, Scotland

The 27th ESReDA Seminar held in Glasgow in November 2004, and organised by Strathclyde University, was devoted to the theme of "The Reliability Case as a Decision Tool". More than 60 participants came to a two day meeting to hear 22 speakers and take part in a discussion forum.

The reliability case is, analogous to a safety case, the body of evidence that is assembled to establish that a new piece of equipment will meet its design reliability requirements. These requirements are often posed in terms of availabilities under different environmental conditions, or reliabilities for specified missions. A combination of different techniques, ranging from FMEA and fault trees to various sorts of developmental testing and operational tests, are employed to give the customer assurance that the requirements will be met.

Reliability cases are generally required for space or military hardware, and are increasingly used in more conventional civilian settings as well. However, "best practice" for the structure of a reliability case has not been established. Therefore the objective of the Seminar was to review how the reliability case is being used in industry, and to identify areas where progress is needed. In particular, attention was given to the question of whether decision theory methods could be used in the broad context of the reliability case to support choices about appropriate methods. Currently the formal decision methods tend to be limited to decisions about test sample size, stopping times for sequential tests etc.

A number of talks were devoted to new methods that model the relationship between different information sources about product reliability. Another theme was the use of reliability growth curves and related techniques in the developmental testing phase in order to determine whether manufacturers are on track with development. Related to this are techniques to support designers in identification of potential faults together with assessments of the likelihood of removing those faults through different design changes. A predictive simulation model was presented which models how faults arise during equipment use and are removed through the development of equipment updates through life. DNV presented a classification tool that certificates equipment when big design changes have been made, for example to cope with changes in operating environment.

A discussion forum held during the seminar brought some interesting facts to light. It was suggested that before the introduction of "Better, cheaper, faster" policies in the US military, 59% of projects had failed the reliability requirements during operational testing. However, after the introduction of "Better, cheaper, faster" this went up to 80%. One of the many problems behind this is the unreasonable level of expectations that – particularly military – customers sometimes have about new equipment. Often several technical innovations are required to achieve the requirements, rather than relying on the safer route of continuous development. It was suggested that better scoping of what is achievable at the start of a project would allow the customer to have more realistic objectives and be in a better position to trade off cost and performance. The realities of commercial life and the constraints imposed by contracts also came out as having a major impact on the design process. On the one hand, from the development manager point of view: "A dollar spent on testing is a dollar spent looking for trouble." On the other hand, customers have become very risk averse in their contract setting, thus leading to little flexibility in the way the testing programme can be carried out to react to results as they become available.

The proceedings of the seminar will be available in early 2005 as part of the ESReDA Seminar Series. More details can be found on the ESReDA website www.esreda.org.

Workshop on Dynamic Reliability: Results and Lessons Learnt on a Benchmark

13th December, 2004

Politecnico di Milano, Italy

Enrico Zio

Politecnico di Milano, Italy

Dynamic reliability aims at broadening the classical event tree/ fault tree methodology so as to account for the mutual interactions between the hardware components of a plant and the physical evolution of its process variables. The dynamical aspects concern

the ordering and timing of events in the accident propagation, the dependence of transition rates and failure criteria on the process variables values, the human operator and control actions. Obviously, a dynamic approach to reliability analysis would not bear any significant added value to the analysis of systems undergoing slow accidental transients for which the control variables do not vary in such a way to affect the component transition rates and/or to demand the intervention of the control.

Dynamic reliability methods are based on a powerful mathematical framework capable of integrating the interactions between the components and the environment in which they function. These methods perform a more realistic modeling of the system and hence improve the quality and accuracy of risk assessment studies. A formal approach to incorporating the dynamic behavior of systems in risk analysis was formulated under the name Probabilistic Dynamics (Devooght and Smidts, 1992). Several methods for tackling the solution to the dynamic reliability problem have been formulated over the past ten years (Cojazzi et al., 1992; Aldemir et al., 1994; Siu, 1994; Izquierdo et al., 1994; Labeau, 1996; Marseguerra and Zio, 1996). Among these, Monte Carlo methods have demonstrated to be particularly efficient in taking up the numerical burden of such analysis, while allowing for flexibility in the assumptions and for a thorough uncertainty and sensitivity analysis (Marseguerra and Zio, 1996; Labeau and Zio, 1998).

For realistic systems, a dynamic approach to reliability analysis is likely to require a significant increase in the computational efforts, due to the need of integrating the dynamic evolution with its characteristic times. The fast increase in computing power has rendered, and will continue to render, more and more feasible the incorporation of dynamics in the safety and reliability models of complex engineering systems.

In the year 2004, the *Italian Association of environmental, safety and reliability analysts, 3ASI (Associazione degli Analisti dell'Ambiente, dell'Affidabilita' e della Sicurezza Industriale)*, the leading national association in the field of safety and reliability, has launched a benchmark exercise on the theme of dynamic reliability, with the aim of testing some emerging methods.

On December 13, 2004, a workshop presenting the results of the benchmark was organized jointly by 3ASI and the Italian Chapter of the IEEE Reliability society. The host of the Workshop was the Politecnico di Milano, Department of Nuclear Engineering. A presentation of dynamic reliability and its general framework was given by Prof. Enrico Zio. Then, two contributions were given to report the results obtained with two different techniques:

- A. Bobbio, D. Codetta Raiteri, Solution of dynamic reliability problems via ordinary and fluid stochastic Petri nets, Turin University
- J. Beati, M. Caira, Dynamic Event Trees, "La Sapienza" University, Rome

The meeting was concluded by a participated discussion on the applicability of the methods.

The technical reports regarding the two presentations are posted on the 3ASI web site (www.3asi.it), in English language. To download the reports, follow the Menu 'Attività' and then 'Documenti' and 'Seminario 3ASI 2004 – Affidabilità Dinamica'

References

- Aldemir, T., Siu, N., Mosleh, A., Cacciabue, P.C., Goktepe, B.G., Eds.: Reliability and Safety Assessment of Dynamic Process System NATO-ASI Series F, Vol. 120 Springer-Verlag, Berlin, 1994.
- Cojazzi, G., Izquierdo, J.M., Melendez E. and Sanchez-Perea M., The Reliability and Safety Assessment of Protection Systems by the Use of Dynamic Event Trees (DET). The DYLAM-TRETA package. Proc. XVIII annaul meeting Spanish Nuclear Society. October 28-30, 1992.
- Devooght, J., Smidts, C., Probabilistic Reactor Dynamics I. The Theory of Continuous Event Trees, Nucl. Sci. and Eng. 111, 3, pp. 229-240, 1992.
- Izquierdo, J.M., Hortal, J., Sanchez-Perea M. and. Melendez E, Automatic Generation of dynamic Event Trees: A Tool for Integrated Safety Assessment (ISA), Reliability and Safety Assessment of Dynamic Process System NATO-ASI Series F, Vol. 120 Springer-Verlag, Berlin, 1994.
- Labeau, P.E., E. Zio, "*The Cell-to-Boundary Method in the Frame of Memorization-Based Monte Carlo Algorithms. A New Computational Improvement in Dynamic Reliability*", Mathematics and Computers in Simulation, Vol. 47, No. 2-5, 1998, 329-347.
- Labeau, P.E., Probabilistic Dynamics: Estimation of Generalized Unreliability Trhough Efficient Monte Carlo Simulation, Annals of Nuclear Energy, Vol. 23, No. 17, pp. 1355-1369, 1996.
- Marseguerra, M. and Zio E., Monte Carlo Approach to PSA for dynamic process systems, Reliab. Eng. & System Safety, vol. 52, pp. 227-241, 1996.
- Siu, N., Risk Assessment for Dynamic Systems: An Overview, Reliab. Eng. & System Safety, vol. 43, pp. 43-74.

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

International Conference on Structural Safety and Reliability ICOSSAR'05

19th-22nd of June, 2005 - Rome, Italy

Conference Website:
http://www.icossar2005.com

Workshop on the Use of Expert Judgment in Decision-Making

21st-23rd of June, 2005

CEA/Cadarache, Château de Cadarache, France

Conference Website:
http://www.cad.cea.fr/wej.htm

Château de Cadarache

OBJECTIVE & SCOPE OF WORKSHOP

CEA (French Atomic Energy Commission) and JRC-IE (Joint Research Centre, Institute for Energy) are organising a 3 day Workshop on the use of Expert Judgement for decision making.

The motivation for this Workshop is the large variety of Expert Judgement approaches which currently exists for different types of application (reliability data for innovative technological systems, environmental studies, PSA, surveillance/maintenance of ageing structures and systems, etc.) and the uncertainty in deciding which approach is most appropriate for a given application.

The objective of the Workshop is to provide a forum for presentation and discussion of all aspects of existing approaches in this area and for cross-comparison of their capabilities and requirements on the basis of practical applications. It will provide an opportunity for sharing of experiences across industrial sectors, including good practice and identification of problem areas.

ESREL 2005 – The European Safety and Reliability Conference

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

TEHOSS 2005 - IEEE International Conference on Technologies for Homeland Security and Safety

28th – 30th of September, 2005 - Gdask, Poland
Conference Website:
http://www.tehoss2005.gda.pl/

ESREL 2006 – The European Safety and Reliability Conference

18th – 22th of September, 2006

Estoril, Portugal

Third International ASRANet Colloquium Integrating Structural Analysis, Risk and Reliability

10th-12nd of July 2006 - Glasgow, UK

Following the success of the second ASRANet International Colloquium held in Barcelona, Spain in July 2004, which attracted around 70 delegates from 17 countries around the world, the Organising Committee now invites papers from researchers and practitioners in Structural Analysis, Risk and Reliability for the third Colloquium, to be held in Glasgow on 10-12 July 2006.

Conference Website:
http://www.asranet.com

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
- Technical University of Liberec, Czech Republic
- École de Mines de Nantes, France
- Henri Poincaré University, France
- ISI, France
- LAAS, 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
- University of Stavanger, 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
- Universidad de Cantabria, Spain
- Universidad de Las Palmas de Gran Canaria, Spain
- Universidad Politecnica de Madrid, Spain
- Universidad Politecnica de Valencia, Spain
- Consejo Superior de Investigaciones Científicas, IMAFF, Spain
- Lulea University, Sweden
- City University London, UK
- Liverpool John Moores University, UK
- University of Bradford, UK
- University of Portsmouth, UK
- University of Salford, UK

1.5 Associate Members

- Nuclear Consultants International, South Africa
- Fulminese Federal University, Brazil
- Univesidad Central de Venezuela, Venezuela

2 ESRA Officers

Chairman

Carlos Guedes Soares (guedess@alfa.ist.utl.pt)
IST, Technical University of Lisbon, Portugal

Vice-Chairman

Enrico Zio (enrico.zio@polimi.it)
Dept. of Nuclear Eng. Polytechnic of Milan, Italy

General Secretary &Treasurer

Pieter van Gelder (p.vangelder@ct.tudelft.nl)
Delft University of Technology, The Netherlands

3 Management Board

The Management Board is composed of the ESRA Officers plus one member from each country, elected by the direct members that constitute the National Chapters.

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.

4 Technical Committees

4.1 Technological Sectors

4.1.1 Offshore Safety

Chairman: B. Leira, NTNU, Norway
E-mail: Bernt.Leira@marin.ntnu.no

4.1.2 Safety of Maritime Transportation

Chairman: C. Guedes Soares, IST, Portugal
E-mail: guedess@alfa.ist.utl.pt

4.1.3 Safety of Land Transportation

Chairman: Gigliola Spadoni, Univ. of Bologna, Italy
E-mail: gigliola.spadoni@mail.ing.unibo.it

4.1.4 Safety in Civil Engineering

Chairman: Ton Vrouwenvelder, TNO Bouw, The Netherlands
Email: A. Vrouwenvelder@bouw.tno.nl

4.1.5 Safety in the Chemical Industry

Chairman: I. Papazoglou, Demokritos Inst. Greece
Email: yannisp@ipta.demokritos.gr

4.1.6 Safety from Natural Hazards

Chairman: J.K. Vrijling, Technical Univ. of Delft, The Netherlands
Email: j.k.vrijling@ct.tudelf.nl

4.2 Methodologies

4.2.1 Reliability of Mechanical Components

Chairman: G.I. Schuëller, Univ. of Innsbruck, Austria
E-mail: G.I.Schueller@uibk.ac.at

4.2.2 Uncertainty and Sensitivity Analysis

Chairman: A. Saltelli, JRC, ISPRA, Italy
E-mail: andrea.saltelli@jrc.it

4.2.3 Human Factors

Chairman: E. Fadier, INRS, France
E-mail: fadier@inrs.fr

4.2.4 Stochastic Modeling and Simulation Techniques

Chairman: Pierre E. Labeau, Université Libre de Bruxelles, Belgium
E-mail: pelabeau@ulb.ac.be

4.2.5 Maintenance Modelling and Applications

Chairman: Enrico Zio, Politechnic of Milan, Italy
Email: enrico.zio@polimi.it

4.2.6 Safety Management

Chairman: A.R. Hale, Technical Univ. of Delft, The Netherlands
Email: a.r.hale@tbm.tudelft.no

4.2.7 Accident and Incident Modelling

Chairman: Chris Johnson, University of Glasgow, UK
Email: Johnson@dcs.gla.ac.uk

4.2.8 Occupational Safety

Chairman: Lars-Harms Ringdhal, Royal Institute of Technology, Sweden
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4.2.9 Quantitative Risk Assessment

Chairman: V. Trbojevic, Risk Support, UK
E-mail: vmt@risk_support.co.uk