



# European Safety and Reliability Association

# Newsletter

<http://www.esrahomepage.org>

February 2002

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## ESRA NEWS

### Letter from the Chairman ESRA Technical Committees

*Carlos Guedes Soares, IST, Portugal, Chairman*



ESRA is widely recognised as the European Association that is responsible for the yearly European Conferences on Safety and Reliability, i.e. the ESREL Conferences. This is indeed one of the important activities of the Association, which mobilises its members and many others beyond the Association.

However, another important activity of the Association is the one performed by its Technical Committees (TC), several of which are organised in Working Groups (WG). These Technical Committees and Working Groups bring together specialists from the member organisations that are working in a specific subject area. The network provided by the contacts between these experts is very valuable insofar as it facilitates the exchange of up-to-date information on the application of technologies and results from the latest research.

In addition to the direct benefit for the individuals who participate in them, the Technical Committees are also an important value for ESRA as it visibly promotes the expertise available in a given field.

The activity of Technical Committees is not funded and therefore a very high level of production cannot

be expected, in particular in view of the very competitive market, which puts all professionals on a very tight schedule as concerns the targets and responsibilities in his/her organisation.

However, despite that limitation, the ESRA Technical Committees have been very valuable and have produced several interesting results. They have organised workshops, which have been well attended, they have produced reports and they have organised sessions at the ESREL Conferences as well as at other Conferences supported by ESRA such as the OMAE annual Conferences.

The role of the Technical Committees in supporting the ESREL Conferences needs to be highlighted as they have promoted and organised a number of sessions as well as having their members presenting papers. This is an important aspect of the activity of the Committees and I would like to encourage an increased participation. It is necessary to smoothen the connection between the Technical Committees and the Programme Committee of the ESREL Conferences by strengthening the communication channels. Obviously, we will need to take steps to ease it, however, Technical Committee members can also be more active in preparing papers and in inviting their colleagues to do likewise.

One area in which the Committees have not been very active is in contributing to the ESRA Newsletter. I would like to invite them to do so vigorously and whenever possible. This would ensure a variety of contributions from various technical areas and could also be a way for the Committees to obtain new active members.

Lately, there have been fewer documents produced by the Technical Committees as they have chosen to concentrate their activities in sessions for and workshops at the ESREL Conferences. Whilst this is important, I believe that it would also be useful to see collective documents produced by a large part of the Committee members. These documents could be state of the art reviews of specific topics in their area or an account of the best practices in some applications, a benchmark study or any other type of report of this sort.

I would like to leave here an open invitation and a challenge for the Technical Committees and Working Groups to aim at producing such documents in a relatively short time frame. I would then collect the contributions of the various Committees and proceed to organise the publication of a book that would contain the contributions of all Technical Committees of ESRA that have accepted this invitation.

The book would have a diversity of topics, but one of the attractions of ESRA is indeed its interdisciplinary nature, reflected by the number of industries represented by its members.

Finally, I would like to recall that each ESRA member has the right to nominate one person from its Company/Institution to each of the existing Technical Committees. Additionally, the Chairmen will invite specialists who they feel are important for the good work of the Committees. Therefore, while we expect that the Committee members be from institutions that are ESRA members, this is not a mandatory requirement.

The policy of ESRA towards the existence of the Technical Committees has been an open one. In general, to propose the creation of a new Committee it is necessary to have a plan of activity, a recognised Chairman and an initial set of members. Therefore, I also leave here the invitation to ESRA members to consider whether they want to start new Technical Committees in areas not yet covered by the existing ones.

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## FEATURES

### **SAFERELNET - Thematic Network on Safety and Reliability of Industrial Products, Systems and Structures**

*Ángelo Teixeira, Instituto Superior Técnico*  
[teixeira@mar.ist.utl.pt](mailto:teixeira@mar.ist.utl.pt)

The SAFERELNET Thematic Network was launched at a two-day Kick-off Meeting held in Lisbon, in early December. Over 50 representatives from 40 organisations attended the successful Meeting hosted by Instituto Superior Técnico, co-ordinator of SAFERELNET.

This network, which was initiated from members of a Technical Committee of the European Safety and Reliability Association (ESRA), is concerned with providing safe and cost-effective solutions for industrial products, systems, facilities and structures across different industrial sectors.

The scope of the Network is the integrated treatment of the important aspects of design, production, operation of industrial products and systems. The main emphasis is on the use of reliability-based methods for the optimal design of products, production facilities, industrial systems and structures from the point of view of balancing the economic aspects associated with providing predefined safety levels, with the associated costs of maintenance and availability. The approaches include modelling the reliability of the systems throughout their lifetime so as to be able to study the impact of new maintenance and repair schemes on system safety, life cycle costs, reliability, serviceability and quality. Methods for the

assessment of existing structures and equipment will be addressed as well as approaches and criteria for extending the lifetime of products and industrial systems safety and with adequate levels of reliability and availability.

The Network aims at improving the coherence of the approaches adopted by the different industries to deal with the above-mentioned problems, in particular as concerns RTD and demonstration activities. It will also assess the importance and maturity of the technologies being developed and will contribute to the technology transfers among the sectors.

The Network is organised in six thematic work packages:

- Risk Assessment Methodology;
- Human and Organisational Factors in Risk Assessments;
- Integration of Risk and Reliability Formulations;
- Reliability Based Design;
- Assessment of Existing Structures and Life Extension;
- Risk Based Inspection and Maintenance Planning.

And in three horizontal workpackages: Standardisation and Codes; Training and Education; Strategy in Various Industrial Sectors. At present the following industrial sectors are explicitly being considered: Offshore Oil and Gas, Maritime Transportation, Motorways, Bridge and Railways, Building, Process and Power (including Nuclear).

The consortium is composed of 44 organisations, from 11 countries with a combination of 26 industrial partners, 10 Universities and 8 Research Organisations. They include several large organisations, but also 7 SME's.

This Network, which has a duration of four years, is funded by the GROWTH programme of the Commission of the European Communities with a budget around 2 Million EUROS. The Network will be organising workshops and producing reports and sectorial overviews, which will be disseminated in due course. A web page will be available shortly with more information about the project (<http://mar.ist.utl.pt/saferelnet>).

In addition to its own activities, the Network will also aim at establishing links with international organisations as well as with other type of Networks that are active in similar areas. Furthermore, although the Consortium has been established, the Network is open to accept new members that are willing to participate on a self-funded basis. This participation depends only on the signing of an agreement, which specifies the contributions that the joining member will provide to the Network in exchange for its participation. Interested organisations should contact the Project Coordinator, Prof. Carlos Guedes Soares ([guedess@mar.ist.utl.pt](mailto:guedess@mar.ist.utl.pt)), directly.

## **ROSSite – The Marie Curie Training Site for Reliability, Safety and Security Studies**

ROSSite, the Marie Curie Training Site at NTNU in Trondheim, Norway, welcomes researchers from EU countries pursuing doctoral or postdoctoral studies, who will address problems related to prevention of failures and accidents in technological systems. Fellowships are offered for a period of 6 – 12 months.

### **ROSSite vision**

ROSSite is a leading multi-disciplinary research and training site – dealing with assessment and evaluation, design and operation of reliable, safe, and secure social and technical systems.

### **Topics**

Topics particularly suitable for doctoral training are:

- Reliability theory
- Safety management with focus on resilient and high reliability organisations
- Risk analysis and the use of risk indicators to monitor risk during operation
- Marine safety
- Reliability of safety-critical functions
- Dependable ICT systems
- Information security
- Safety psychology and risk perception

### **ROSSite resources**

The Training Site is located at The Norwegian University of Science and Technology (NTNU) in Trondheim, Norway. NTNU has about 18 500 students, including 1250 doctoral students, and there are about 1000 professors (17 % women). One in six engineering doctoral degrees is received by women. SINTEF is one of Europe's largest independent research organisations with 1,800 employees and an annual turnover of NOK 1.5 billion. SINTEF performs contract research and development for industry and the public sector in the fields of technology and the natural and social sciences. SINTEF operates in close collaboration with NTNU. The experts co-operate in projects and share laboratories and equipment.

NTNU offers a world-class education programme in safety, reliability and security. A large number of course modules in the subject areas are given regularly at NTNU, ranging from introductory to PhD level.

### **Description of ROSSite**

ROSSite is a co-operation between several departments at NTNU, and SINTEF Industrial Management, Department of Safety and Reliability. The key participants are:

Departments	Topics covered
Production and Quality Engineering	System reliability, safety and maintenance, risk analysis, risk indicators, vulnerability assessment of production systems and infrastructures
Marine Technology	Structural reliability, risk analysis of marine systems and operations
Telematics	Computer, communication and information security, design and evaluation of dependable information and communication (ICT) systems, fault tolerance
Industrial economy and Technology Management	Safety management, safety health and environment (SHE), organisational factors
Mathematics and Statistics	Reliability theory, probability theory, life data analysis
Psychology	Safety psychology, risk perception, risk communication
SINTEF Industrial Management, Dept. of Safety and Reliability	System reliability, risk analysis, safety management – applied research projects

### Financing of the fellowship

Fellows will be paid for a return ticket (travel both ways) restricted to economy class air and/or rail fare. Up to 100 Euro/month in total. Fellows will receive 1200 Euro/month in mobility allowance/salary.

The Fellow will be given access to research facilities necessary to carry out the research training. The research funding will be decided by NTNU dependant on type and length of the research training project.

### How to apply

Application and supporting information for a fellowship should be completed and sent to the coordinator of ROSSite, Professor Marvin Rausand, at E-mail:

[marvin.rausand@ipk.ntnu.no](mailto:marvin.rausand@ipk.ntnu.no).

Further information, and application form may be found on the website:

<http://www.ipk.ntnu.no/mcts>

## Ph.D.-thesis “Risk Based Maintenance Decisions - A Subjectivistic Approach”

Sigve Apeland has recently defended his thesis "Risk Based Maintenance Decisions – A Subjectivistic Approach". The thesis deals with the problem of applying a risk based approach to maintenance optimization using a coherent implementation of historical “hard data”, engineering judgments and uncertainty evaluation.

Evaluating what are the “optimal” maintenance strategies with respect to some system implies performing predictions related to what are the

consequences of alternative maintenance activities. Such predictions are normally subject to uncertainty, and one way of dealing with such uncertainty is to apply a risk based approach.

It is, however, no consensus of what a “risk based approach” implies. Differences in opinion exist with respect to how to integrate historical “hard data” and subjective information, so-called “engineering judgments” into the analysis. Also, there seems to be no clear agreement on how uncertainty should be dealt with in a way that is both practically possible and that has a solid theoretical foundation.

In general, there exist two dominant views on how to address the above discussion. The Classical (frequency) approach represents the traditional way of dealing with historical “hard data”, where risk is defined as an expectation of what will be the future result, based on thought experiments related to infinite repetitions of the events under analysis. To estimate such risk, a statistical evaluation of available data is performed to produce elements in the analysis, like probabilities and parameters.

The second view is represented by the Bayesian approach to risk analysis. Risk has the same meaning as under the Classical view, but this approach allows for integration of subjective information. Often, historical data are not available, or available information is not representative, and thus, integration of such judgments may be necessary. The subjective information in question is related to evaluations of what are the values of the probabilities and parameters.

In his thesis, Apeland argues that the above approaches imply significant practical problems when applied to maintenance decision problems. First, sufficient historical “hard data” are rarely available for performing Classical analysis on systems subject to new or improved technology, which often is the situation when performing new analysis. Second, application of the above Bayesian approach implies that uncertainty measures are to be quantified for all quantities in the analysis (probabilities, parameters, ...). Performing such quantification will not be practicable possible for most purposes, and the results from such analysis can often be confusing; first, uncertainty exists with respect to what will happen, described through the risk measures, then, uncertainty exists with respect to what are the values of the risk measures, described through the subjective evaluations.

In an alternative approach, the predictive, epistemic uncertainty approach, which is the basis for Apeland's thesis, a much more direct approach to risk analysis and uncertainty treatment is used. In this approach risk is a measure used to express uncertainty related to future events, rather than existing as a true value to be estimated. The uncertainty is epistemic, meaning that it represents the analysts subjective judgments

with respect to what is the consequences of alternative strategies, based, however, on both historical "hard data" and engineering judgments. Thus, a more direct and simple way of predicting future events is applied, where coherence is achieved with respect to uncertainty treatment and implementation of historical "hard data" and engineering judgments in a practical way.

Please contact Sigve Apeland on E-mail for more information ([sigve.apeland@st-polytec.no](mailto:sigve.apeland@st-polytec.no))

## **Ph.D.-thesis "Stochastic Modelling and Optimization of the Condition-Based Maintenance for Continuously Deteriorating Systems"**

Bruno Castanier has recently (14-12-2001) defended his thesis "Stochastic Modelling and Optimization of the Condition-Based Maintenance for Continuously Deteriorating Systems". This thesis was carried out at the Troyes University of Technology (UTT). Adjunct Professors Christophe Berenguer and Antoine Grall, Department of Systems Dependability and Modelling, UTT, have been supervisors throughout this work. Members of the committee to judge the dissertation were Professor Gilles Celeux, INRIA-Grenoble, Professor Daoud Aït Kadi, Université Laval (Québec), Professor Michel Roussignol, Université de Marne-la-Vallée, Professor Yves Dutuit, Université Bordeaux-1, Professor Eric Châtelet, UTT, Adjunct Professors Christophe Berenguer and Antoine Grall, UTT.

Condition-based maintenance allows to determine the nature of the current action to make on the system and possibly the date of the next maintenance intervention according to the current system state. Condition-based maintenance is an efficient tool to control the compromise between preventive and corrective maintenance. However, the implementation in an industrial context is often empirical and does not lead to the best earnings.

In this manuscript, we suggest building a tool to the decision-making allowing to rationalize the maintenance rules. So as to optimize the interventions sequence on the system, it is necessary to be able to evaluate the impact of a maintenance decision on the system in exploitation phase and so to quantify the effects of a maintenance action.

After a bibliographical study of the maintenance models, we suggest setting up a common parametric policy and we construct a model for the evaluation of its performance. The current maintenance action (a perfect replacement or a simple inspection) and the next intervention date can be determined in a sequential way for a system formed by a single-component that deteriorates continuously until a critical level. The construction of the long-term

average criterion for the policy performance asymptotique is based on the regeneration properties of the degradation process of the maintained system.

Then several policy extensions are proposed to more general maintenance problems:

- System subjected to statutory constraints,
- Imperfect maintenance operations,
- Possibility of controlling the efficiency of partial repair in respect with its duration,
- Studies of the grouping operations for multi-components.

The evaluation of the performance criteria is based on Markov renewal properties of the system evolution process.

## **Subsea reliability cooperation between oil companies and subsea manufacturers – A vehicle to make reliable deepwater development happen!**

*Runar Østebø, OREDA Steering Committee Chairman*

The OREDA Joint Industry Project Forum has recently established a framework co-operation with the main subsea equipment suppliers ABB Offshore Systems, Cameron Controls, FMC Kongsberg Subsea and Kvaerner Oilfield Products. OREDA<sup>®</sup> (Offshore RELiability Data) is a project organisation sponsored by nine international oil companies, i.e. BP, ChevronTexaco, ENI/Agip, ExxonMobil, Norsk Hydro, Phillips Petroleum Company, Shell, Statoil and TotalFinaElf. OREDA's main aim is to collect and exchange reliability data among the participating oil companies and act as The Forum for co-ordination and management of reliability data collection within the oil and gas industry. The OREDA companies have focused on subsea equipment reliability in recent years by establishing dedicated OREDA-subsea tools, and by the close co-operation with subsea manufacturers this will be an "instrument" for the E&P industry to meet challenges in deepwater field development and operation. The main objective is to improve the quality of subsea equipment by the manufacturers utilising the operating experience to improve their design. The oil companies benefit through improved reliable equipment and thereby increase safety and production, and reduce operation and intervention costs. The designers will obtain feedback on the performance of their equipment during service and compare the performance of their equipment against industry standard.

The following types of subsea equipment are e.g. addressed:

- X-mas tree, including choke valves

- Control systems, including subsea control pods
- Manifolds
- Flowlines
- Riser
- Pumps
- Subsea processing etc.

OREDA Steering Committee Chairman Runar Østebø, Statoil is responsible for the OREDA subsea workgroup activities in which a constructive dialogue on reliability takes place between oil companies and equipment vendors. This is in line with OREDA Policy of "Feedback of operational experience to vendors to improve the quality of E&P equipment", and close the often expressed missing link of performance feedback between oil companies and vendors. Statoil has had high benefit of using and implementing OREDA-subsea reliability data in which now more than 400 well-years have been captured in OREDA-format. "This gives Statoil a proven and standard method in line with ISO 14224 - to communicate and control reliability for all our subsea assets".

Contact address: Runar Østebø, Statoil, Stavanger, Norway. E-mail: [runos@statoil.com](mailto:runos@statoil.com)

## Call for including a test-case item in ESRA-Newsletter issues

*Prof. Yves Dutuit, Bordeaux-1 University*

*Chairman of the TC "Dependability Modelling"*

*E-mail: [dutuit@hse.iuta.u-bordeaux.fr](mailto:dutuit@hse.iuta.u-bordeaux.fr)*

On behalf of both the "Methodological Research Working Group" (MRWG) of the French Institute for Dependability and Safety (ISdF in French) and the ESRA Technical Committee (TC), entitled "Dependability Modelling", which I am in charge of, I would like to propose to introduce periodically in ESRA-Newsletter a new heading or item. This item could be devoted to a short presentation of a test-case exercise to be solved.

Its interest lies in the difficulty of:

- Its formal or unformal formulation which must be expressed without any ambiguity,
- The modelling of the concerned system or its behaviour,
- The assessment of the performance of this system in terms of reliability, availability, production capacity....

Moreover, a collection of such exercises with their solutions could contribute to build up a pedagogical guide or a specific practical booklet for students. The test-case activity is one of the main activities of the MRWG of ISdF for a long time and this proposal, if it is accepted, could play a great part in the spreading of this activity at a European level.

As an example of such a test-case, a first simple (but not trivial) problem is proposed hereafter. The solutions proposed by the readers will be examined and published, maybe in a future issue of the Newsletter or on the ESRA website. Please send proposed solutions to [dutuit@hse.iuta.u-bordeaux.fr](mailto:dutuit@hse.iuta.u-bordeaux.fr).

I am looking forward to any response and hope that interesting information exchange will start soon and will be reinforced during the next ESREL Conference by means of the Workshop devoted to this topic.

### Test-case description

The system to be studied is described as follows:

It consists mainly in a serie structure of three non-repairable components C, D and E. Two other non-repairable components A and B are used as spares. A is connected in parallel to both C and D. B is connected in parallel to both D and E. They are in cold standby. A starts when C fails. B starts when D or E fails. All the components have the same failure rate ( $\Lambda = 10 \text{ E-}4 \text{ per hour}$ ), when they work. The system mission time considered is T ( $T = 1000 \text{ hours}$ ).

The aim of this exercise, due to André Cabarbaye from CNES-Toulouse (Centre National d'Etudes Spatiales), is twofold. It is:

1. To calculate the reliability  $R(T)$  and the availability  $A(T)$  of the system (in spite of the non-repairable nature of the components,  $R(T)$  differs from  $A(T)$ );
2. To determine the event-sequences (not the minimal cutsets) leading to the mission failure (system unreliability) and to compute their probabilities.

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## REVIEWS

### ESRA on the WWW

Please visit our pages and send your feedback to the Webmaster. The ESRA-homepage is available at

<http://www.esrahomepage.org/>

### 21th ESReDA Seminar on lifetime management

The seminar took place on 5-6.11.2001 organised by ESReDA (jointly with JRC/ISIS) and hosted by Framatome-ANP. There were about 40 participants. 16 papers were presented covering the fields of NPP Aging Survey Concepts, Aging Mechanisms, NPP Aging Monitoring, Aging & reliability Assessment

Methods, and Non-Nuclear Industry Ageing Management.

In the field of the NPP Ageing Survey Concepts, a survey of concepts was carried out: Speakers believed that lifetime management is very focused on safety, even if the periodicity agrees with the different phases of the Life Cycle Management (LCM), physical aging, and other operational constraints. The methodology generally used is the one proposed by the IAEA in 1992, mainly deterministic (not probabilistic). Nevertheless, if the LCM has to be optimized, the integration of uncertainty and probabilistic approaches are then necessary. The development of the DB tools containing list of degradation mechanisms or list of components failures, like the KAYAM tool, is to be developed. It could be a recommended action for the future. All the speakers agreed that all monitoring measures are well-adapted. This was difficult to accept/understand by some experts in the session, who argued that the more a plant/a component is ageing the more it needs surveillance? It was also recommended to develop studies combining human management and long term reliability modelling, including materials degradation mechanisms.

In Ageing Mechanisms field, there was an agreement that the first aim of Aging Management is the prevention of replacing important components (expensive, not-easy to be replaced). The better the knowledge of the damage mechanisms the better the possibilities of mitigating actions. Besides plant specific design or manufacturing problems, corrosion and fatigue are the dominant aging mechanisms Even after more than 40 years of operation, damage under specific boundary conditions still occur and could not be detected in the plant so far. A better cooperation between "aging mechanisms specialists" and "PSA-specialists" seems fruitful and then recommended. That should offer PSA-specialists access to additional databases.

For NPP Ageing Monitoring, two papers were interested in how to reduce inspection and maintenance activities while still keeping appropriate safety level and production availability. Papers insisted on one important aspect of the problem which is how to select systems and components that should be subjected to detailed analyses, and how to identify those that need lesser effort. A third paper used different statistical methods on data from 67 power stations to try to identify the important parameters that causes some stations to be shutdown prematurely, some to be shutdown after normal lifetime and some to be licensed for extended lifetime.

In the field of Ageing & Reliability Methods, speakers agreed that reliability models integrating failure rate time dependence are needed in order to treat Component/system ageing correctly. At present, R&D efforts are needed to develop both adequate time-dependent models and failure database relevant

to these models. The presented papers covered the sub-domains; mathematical modeling, time-dependant data and specific applications.

In the Non-Nuclear Field, some specific problems such as the long-term development of reliability and availability figures in a deregulated power market confronted with increased competition, was addressed. Participants were wondering if these new conditions would give rise to new safety problems. For instance, the installations in other applications that depend on the availability of the electrical power would certainly be affected. In one presentation the author addressed a methodology to predict technical safety conditions of on- and offshore units. It was clear that the incorporation of human error (which has not yet been done) in the analysis might lead to even more valuable results.

For proceeding and related materials contact M. Eid ([Mohamed.eid@cea.fr](mailto:Mohamed.eid@cea.fr)).

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## SAFETY AND RELIABILITY EVENTS

### SAMO 2002

Summer School on Sensitivity Analysis of Model Output

*Venice, June 12-15, 2002*

The ESRA TC on Uncertainty and Sensitivity analysis promotes a summer school on Sensitivity Analysis of Model Output to be held in Venice on June 12-15 2002. The school is organised by the Joint Research Centre of the European Commission, in collaboration with the University of Venice.

#### Background

Simulation models are used in many settings (financial, insurance and technological risk analysis, structural design, environmental appraisal, etc.) and for different purposes (support decision-making, predict trends, solve inverse problems, etc.). Models are flawed by uncertainties. Knowledge uncertainty, uncertainty in observations, poorly known physical parameters, alternative value judgements can impinge on the defensibility of model-based results. The model X-raying offered by sensitivity analysis is useful to investigate how inaccuracies, inconsistencies, missing data, subjective elements introduced by the analyst, affect the outcome of an analysis.

#### Objectives

Goal of the summer school is to make the participants aware of the state-of-the-art methods in sensitivity

analysis, to stimulate the flow of new ideas, and to suggest new research directions. Application case studies and hands-on sessions using software packages will show how sensitivity analysis can be used to supply transparent pictures of the state-of-quality of model-based results and can be beneficial to their defensibility.

### Methods

A series of 17 lectures will be given to cover most of the methodological advances in the field of sensitivity analysis:

- Overview of Global Sensitivity Analysis, A. Saltelli (JRC, Italy)
- Sampling Based Methods (I, II), J. Helton (SANDIA, New Mexico)
- Evaluating Prediction Uncertainty, M. McKay (Los Alamos, New Mexico)
- Modelling dependence in uncertainty analysis, R. Cooke (TU Delft, The Netherlands)
- Local Probabilistic Sensitivity Measures, R. Cooke
- Sensitivity Analysis in FORM and SORM, E. Castillo (Univ. Cantabria, Spain)
- On uncertainty importance in mathematical models, A. Saltelli
- Screening methods, F. Campolongo (JRC, Italy)
- Variance based methods, I. Sobol' (Russian Academy of Sciences)
- Fourier Amplitude sensitivity test (FAST), S. Tarantola (JRC, Italy)
- Practical procedures for Variance based methods, T. Homma (JAERI, Japan)
- Sensitivity analysis in a Bayesian modelling framework, M. Jansen (Wageningen University, NL)
- Entropy-based sensitivity methods, B. Krzykacz (GRS, Germany)
- Local Sensitivity Analysis and Adjoint Modelling, U. Callies (GKSS, Germany)
- Data-based mechanistic modelling, P. Young (Lancaster University, UK)
- Monte Carlo Filtering and Generalised Likelihood Uncertainty Estimation (GLUE), M. Ratto (JRC, Italy)
- Sensitivity Analysis and Financial Engineering, M. Koda (University of Tsukuba, Japan)

In addition, 10 application lectures will be given to cover a number of fields: environmental appraisal and decision-making, financial risk, performance indicators for integrated environmental/transportation policy, short-term time series analysis in econometrics, physics, macro-economy, etc.

Hands-on sessions will be organised in the laboratories of the University of Venice. Participants can test four different codes for uncertainty and sensitivity analysis: SIMLAB (JRC), GLUEWIN (JRC), UNICORN (TU Delft), CAPTAIN Matlab Toolbox (CRES, Lancaster, UK).

### Venue

The summer school will be held at the University of Venice "Ca' Foscari", Faculty of Mathematical, Physical and Natural Sciences, Dorsoduro 2137,

Venice. Arrival is planned for June 11<sup>th</sup> and departure either on June 15 (Saturday) or June 16 (Sunday).

### Who should attend?

The school is open to researchers (from universities and private companies), Ph.D. students in scientific disciplines, and officers of European and National organisations. Basic experience in mathematical modelling and knowledge of fundamental statistics is required. The school will be useful to those who wish to learn more about the statistical tools that may support a better understanding of the behaviour of simulation models employed in a variety of settings.

### Participation and Fees

We plan for maximum 60 participants. The cost of participation to the summer school is 500 € (300 € for students below 30 years age) and includes registration fee, coffee breaks, lunches, social dinner and a volume containing presentation slides. It excludes accommodation.

### Accommodation

Hotels in Venice are quite small and it is impossible to gather all the participants in one single hotel. However, we have stipulated a convention with Hotel del Sole: they have a number of rooms available for participants to SAMO2002. Participants are suggested to plan for their own accommodation as soon as possible.

### Time schedule

February 28, 2002: Deadline for application

April 15, 2002: Deadline for registration (with payment of registration fee)

June 12-15, 2002: Summer school

After SAMO 2002: communication by Internet (forum on Sensitivity analysis)

### Registration form

Registration forms and other information on the summer school is available at:

<http://sensitivity-analysis.jrc.cec.eu.int/> and

<http://webfarm.jrc.cec.eu.int/uasa/evt-samo2002.asp>

### Credits

A certificate for the summer school will be provided upon its completion.

### Sponsors

SAMO 2002 is sponsored by the European Safety and Reliability Association and the IEEE Reliability Society - Italian Chapter.

Financial support will be provided by the European Commission through the KD-net thematic network of the IST programme.

### Previous SAMO meetings

The sensitivity analysis community is composed of investigators from a wide spectrum of disciplines. After three international symposia devoted to Sensitivity Analysis (Belgirate, (I), 1995, Venice,



1998 and Madrid, 2001), and one summer school in Venice, 1999, several people have expressed their desire to have a second Summer School devoted to the topic, easier to attend for users not familiar with the discipline as well as for users wishing to get information on contiguous methods and/or fields of application.

#### **Further information**

For further information please contact Stefano Tarantola at [stefano.tarantola@irc.it](mailto:stefano.tarantola@irc.it)

### **ESReDA - 22<sup>nd</sup> Seminar**

The 22<sup>nd</sup> ESReDA Seminar on Maintenance Management & Optimization

*May 27-28, 2002, Madrid*

#### **Scope & conference topics**

In the current competitive society, achieving high levels of availability is of fundamental importance to get an efficient operation of any device or system. In this context, maintenance is a critical factor for many companies, specially if its significant contribution to dependability and associated costs are taken into account.

Modern ideas on maintenance are quite different from the out-of-date traditional approach of fire-fighting breakdowns. On the other hand, maintenance is arising as one of the factors to be included in the balanced score card of the top management.

The purpose of the seminar is to provide a forum for presentation and discussion of all aspects related with Maintenance, from analysis methods to practical applications, developments and data.

#### **Suggested paper topics**

Papers for the seminar are expected from industrial areas such as oil and gas industry, nuclear and fossil power plants, transportation, chemical and petrochemical facilities, aerospace industry, civil engineering, manufacturing industry, as well as from universities, R&D organizations, engineering contractors, consultants and authorities.

Major technical topics are maintainability and dependability, maintenance management, maintenance optimization, RCM, TPM, condition monitoring and predictive maintenance, maintenance effectiveness, design for maintainability and maintenance data

#### **Submission of papers**

Authors who wish to present a paper are requested to submit a summary, preferably by e-mail, to:

Mr. Antonio J. Fernández (IBERINCO)

Avda. de Burgos, 8 B.

28036 Madrid, Spain

Fax: + 34 913 83 31 80

E-mail: [afp@iberinco.es](mailto:afp@iberinco.es)

For detailed information contact Dr. Antonio Sola ([antonio.sola@iberdrola.es](mailto:antonio.sola@iberdrola.es)), or Mohamed Eid ([Mohamed.eid@cea.fr](mailto:Mohamed.eid@cea.fr)). Home page on: [http://www.vtt.fi/aut/tau/network/esreda/esr\\_home.htm](http://www.vtt.fi/aut/tau/network/esreda/esr_home.htm)

### **KONBiN ' 03**

The 3-rd Safety and Reliability International Conference To Safer Life and Environment

*May 26-29, 2003, Gdynia, Poland*

First announcement and call for papers

#### **What is KONBiN**

The conference is focused on the problems of the creation and assurance of safety and reliability in the human-technology-environment systems.

#### **Who Should Attend**

The conference is addressed to university and research institutes scientists, industry and transport employees, government and municipal bodies, reliability and safety consultants and other persons interested in the conference topics.

#### **Preparation and Submission of Papers**

Authors of papers are requested to submit an abstract directly to the Conference Secretariat (preferably by e-mail). Obligatory abstract form may be found at the Conference homepage.

The abstract limited to one page should include: conference topic(s), paper title, author's name(s), affiliation and e-mail address(es), statement and objective of the paper, problem description, results achieved, clearly pointed innovative part of the contribution, relevant references, short biography (maximum 5 lines) or/and URL address.

#### **Proceedings**

Papers will be published in a book that will be available at the beginning of the conference.

#### **Schedule of Events**

Receipt of Abstracts April 30, 2002

Notification of Authors June 30, 2002

#### **Organising Committee**

Chairman Jozef Zurek

Secretary Grzegorz Kowalczyk

#### **Conference Secretariat**

Gdynia Maritime University, ul. Morska 83, Poland

e-mail: [katmatkk@wsm.gdynia.pl](mailto:katmatkk@wsm.gdynia.pl) fax: (48-58) 6206701

KONBiN homepage

<http://www.wsm.gdynia.pl/konbin/>

## Seminars and conferences

March 18-22, 2002

### ESREL 2002



The Conference λμ13-ESREL 2002 “Safety and Reliability: Facilitating Decision Making and Risk Management” is very soon arranged in Lyon, France.

For information about the programme, please visit the ESREL 2002 homepage at <http://www-assoc.frec.bull.fr/isdf/lm13/>

June 17-20, 2002

### MMR 2002

Third International Conference On Mathematical Methods In Reliability Methodology And Practice in Trondheim, Norway. More information at <http://www.math.ntnu.no/mmr2002/>

June 23-28, 2002

### PSAM6

6th International Conference on Probabilistic Safety Assessment and Management 23 - 28 June 2002, San Juan, Puerto Rico, USA. For more information, visit: <http://www.bearcanyon.net/psam6/psam6.html>

PSAM 6 Secretariat  
Ms. Jennifer Hill  
c/o Beta Corporation International  
6719-D Academy Road NE  
Albuquerque, NM 87109 USA  
E-mail: [jennifer@betaci.com](mailto:jennifer@betaci.com)

June 23-28, 2002

### OMAE 2002

The 21st International Conference on Offshore Mechanics and Arctic Engineering, organized by the Ocean, Offshore, and Arctic Engineering Division of the American Society of Mechanical Engineers and The Norwegian Society of Chartered Engineers will be held in Oslo, Norway, June 23 28, 2002. This conference, which is supported by ESRA, is organised in 7 symposia, one of which is on Safety and Reliability. Further information about the

Conference may be found at the address <http://www.asmeconferences.org/omae02/>.

July 7 - 12, 2002

### Fifth World Congress on Computational Mechanics,

The Fifth World Congress on Computational Mechanics is being planned for in Vienna, Austria, EU the July 7 - 12, 2002

This quadrennial international congress will feature all aspects of developments and innovative applications of concepts of computational mechanics. WCCM'02 will also feature a Minisymposium on "Computational Methods in Stochastic Mechanics and Reliability Analysis (CMSM & RA)". For details on the conference you may want to visit the congress web site <http://wccm.tuwien.ac.at>

If you have any questions on the technical program of the Minisymposium as part of the congress please feel free to contact Gerhart Schueller by e-mail at [Mechanik@uibk.ac.at](mailto:Mechanik@uibk.ac.at) or Masanobu Shinozuka at [shino@usc.edu](mailto:shino@usc.edu).

Questions about registration and local arrangements may be directed to the Organizing Committee, [general@wccm.tuwien.ac.at](mailto:general@wccm.tuwien.ac.at).

July 8-10, 2002

### 1<sup>st</sup> International ASRANet Colloquium

The 1<sup>st</sup> International ASRANet Colloquium will be arranged in Glasgow, Scotland. The programme will include keynote papers from invited speakers, workshops and presentations of submitted papers.

The Colloquium will draw on recent experience in order to explore the full range of analytical and computational procedures relevant to stochastic modelling of engineering structures. Another intention is to contribute to the formulation of suitable and well-defined benchmark problems associated with SRA and ASA.

For more information, contact Professor P. K. Das at the Universities of Glasgow and Strathclyde ([P.K.Das@na-me.ac.uk](mailto:P.K.Das@na-me.ac.uk)) or on the website <http://www.asranet.com>.

September 2-5, 2002

### EURODYN 2002

5th International Conference on Structural Dynamics, Munich, Germany. This conference has a strong emphasis on reliability assessment of stochastic structural systems. More information at: <http://www.bm.bv.tum.de/eurodyn2002>

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# ESRA INFORMATION

## 1 Membership

### 1.1 Professional Associations

- The Safety and Reliability Society, UK
- The Institute of Quality Assurance, UK
- The Danish Society of Risk Assessment
- Institut de Sûreté de Fonctionnement, France
- ESRA Austria
- ESRA Germany
- VEIKI Hungary
- The 3 ASI, Italy
- ESRA Norway
- SRE Scandinavia
- The Netherlands Society for Risk Analysis and Reliability (NVRB)
- ESRA Poland
- Asociación Española para la Calidad, Spain
- ESReDA

### 1.2 Companies

- AEA Technology, UK
- RAILTRACK UK
- W.S. Atkins Safety and Reliability, UK
- RMRI Ltd. UK
- Health & Safety Executive, UK
- Transgás - Gás Natural, Portugal
- Companhia Portuguesa de Produção Eléctrica, Portugal
- Caminhos de Ferro Portugueses, Portugal
- IDICT, Portugal
- Direcção de Navios, Ministério da Defesa Nacional, Portugal
- Bureau Veritas, France
- TECSA, SpA, Italy
- Tecnopolis Csata Novus Ortus, Italy
- Registro Italiano Navale, Italy
- Safetec Nordic AS, Norway
- OFP Arsenal, Austria
- FZ Seibersdorf, Austria
- Palfinger Krantechnik GmbH, Austria
- VAB, Austria
- RiskAudit, France
- Commissariat à l'Énergie Atomique, France
- EdF, France
- INRS, France
- Elf Aquitaine Production, France
- VTT, Finland
- Forschungszentrum Jülich GmbH, Germany
- GRS, Germany
- Finnish Institute of Occupational Health
- TNO Defence Research, The Netherlands
- COWI Consult

### 1.3 Educational Institutions:

- University of Surrey, UK
- University of Bradford, UK
- City University London, UK
- Loughborough University of Technology, UK
- Università Degli Studi di Pisa, Italy
- Università Degli Studi di Pavia, Italy
- Politecnico di Milano, Italy
- Politecnico di Torino, Italy
- Delft University of Technology, the Netherlands
- Technical University of Gdansk, Poland
- University of Gdynia, Poland
- Central Mining Institute, Poland
- Universität Dresden, Germany
- TU Muenchen, Germany
- University of Wuppertal, Germany
- The Institute of Nuclear Technology 'Demokritos' Greece
- Instituto Superior Técnico, Portugal
- ITEC, Portugal
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- Universidade Nova de Lisboa, Portugal
- Université Libre de Bruxelles, Belgium
- Université de Bordeaux, France
- Lulea University, Sweden
- University of Innsbruck, Austria
- Universidad Politécnica de Madrid, Spain
- Universidad Politécnica de Valencia, Spain
- Universidad D. Carlos III de Madrid, Spain
- Consejo Superior de Investigaciones Científicas, IMAFF, Spain
- Institute of Fundamental Technological Research, Poland
- Université de Technologie de Troyes, France
- Politecnico di Torino, Italy
- University of Wrocław, Poland
- NTNU, Norway

## 2 ESRA Officials

### Chairman

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IST, Technical University of Lisbon, Portugal

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Université Boredeaux-1/LAP, FR

### 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 Offshore Safety Technical Committee

Chairman: C. Guedes Soares, IST, Portugal.  
E-mail: [guedess@alfa.ist.utl.pt](mailto:guedess@alfa.ist.utl.pt)

#### 4.1.1WG on Quantified Risk Assessment

Chairman: V. Trbojevic, EQE International Ltd, UK.  
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#### 4.1.2WG on Structural Reliability

Chairman: B. Leira, NTNU, Norway  
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#### 4.1.3WG on Safety of Marine Transportation

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E-mail: [guedess@alfa.ist.utl.pt](mailto:guedess@alfa.ist.utl.pt)

#### 4.2 Reliability of Mechanical Components

Chairman: G.I. Schuëller, University of Innsbruck  
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#### 4.4 Human Factors

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#### 4.5 Risk Management

Chairman: I. Watson, UK  
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#### 4.5.1WG on Computer Aided Risk Management

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#### 4.6 Monte-Carlo Simulation

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#### 4.7 Dependability Modelling

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

For more information about ESRA, look at our web-page at <http://www.esrahomepage.org>.

For application for membership of ESRA, please contact the general secretary, Palle Christensen, E-mail: [palle.christensen@risoe.dk](mailto:palle.christensen@risoe.dk).

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