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**PRESENTATION OF WORK PERFORMED  
BY ESReDA "ACCIDENT ANALYSIS" WORKING  
GROUP AND GOALS FOR THE FUTURE**

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**Summary**

The Accident Analysis working group was initiated in January 1993. Three meetings were organised with active participation of representatives of the European Joint Research Center - Ispra -, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden and United Kingdom. Interests of participants were divided between two major areas : validation of physical models and softwares for consequences assessment of major accidents and a more statistical approach of data collected on accidents to define a safety policy in relationship with regulations, insurance, economic and social costs.

A first step was to prepare a questionnaire for assessing strengths and deficiencies of existing databases. The answers to the questionnaire distributed in 1994 in the above mentioned countries were analysed.

Future work will be devoted to issuing a review document of pertinent databases on accidents developed in Europe in order to promote convenient use of databases and networking between developers and end-users.

### **Acknowledgements**

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### **I - INTRODUCTION -**

At the ESReDA Executive Committee meeting, on June 9th, 1992, it was decided to initiate a working group on Accident Analysis under the supervision of J.P. PINEAU. Every ESReDA member was invited to provide suggestions and members. After some preliminary attempts to define a protocol on networking conditions between organisations managing databases and end-users of databases, it became evident that there was first a need to exchange information between database managers, developers and end-users.

The scope of accident scenarios is unlimited : accidents at home, during transportation or in the workplace with consequences for men, the economy or the environment. As a field of application for this group, accidents for consideration were to be only of an

industrial or transport nature in which hazardous substances were involved. By reference to this limitation, the work would be directly related to the application of the Seveso Directive dealing with specially hazardous plants and to the regulations for power plants and transportation. It could also be assumed that any database system on accidents would probably have similar requirements as regards data collection, validation and storage for easy retrieval, verification of dependability and convenient use of data. The investigation performed by the working group which will be described can readily be extended to other types of database.

For the purpose of the present project, a database is defined as any collection of accident data independent of the storage medium (e.g. card index or CD ROM).

As a final objective, members of the working group accepted the promotion of networking of current databases for more efficient use by end users.

In this paper, a summary of individual interests of involved members is first given by reference to different possible goals and final objectives. A further section is devoted to reasons why, in a first stage, a questionnaire for assessing the strengths and deficiencies of databases on industrial accidents was prepared. The findings from the analysis of returned questionnaires (93 from 13 different countries) are described in another paper.

In a final paragraph suggested future work for the "Accident Analysis" working group is presented.

## **II - INDIVIDUAL INTERESTS OF MEMBERS AND POSSIBLE GOALS IN ACCIDENT ANALYSIS -**

## **II-1 Main interests of members**

The members came from organisations directly linked with industrial groups (EdF Cli, Gesellschaft fur Anlagen und Reaktorsicherheit -GRS-, Norsk Hydro), from consultant organisations (Det Norske Veritas, Four Elements Ltd, Nukem), competent authority (HSE), research bodies (Disaster Prevention and Limitation Unit-DPLU, University of Bradford, INERIS, Joint Research Center, ISPRA, TNO Environmental and Energy Research and VTT Energy), insurance sector (St Paul International) and an association related to safety and reliability (3 ASI). A complete list of participants is given in appendix 1.

Some members were involved in the development and/or management of databases such as FACTS, FIRE, MARS, MHIDAS, WOAD... with wide fields of application.

The interests of the members can be differentiated into two main areas :

- validation of physical models and software to be used for assessment of consequences arising from major accidents (emission, explosion, fires)
- a more statistical approach to accident data, taking into account economic, environmental and social costs in relationship to the probabilities of occurrence. The main aspect is safety policy related to regulation, insurance and safety management. Quantitative risk assessment could also be an area of major relevance.

## **II-2 - Possible goals and final objectives**

When considering such broad areas it must be realized that current databases have wide implications directed to various goals :

- Identify accident scenarios
- Identify deficiencies of potentially hazardous plants and transportation systems (design and operation)
- help to identify whether current emergency procedures are appropriate
- assist national and international competent authorities and financial and insurance companies to formulate proactive policies
- develop quality aspects for data and software
- improve total quality management of safety
- collect reliability data and failure rates
- look at compliance with regulations, codes of practice and standards
- develop training of operators and management
- encourage the incorporation and use of databases in the curricula of universities and other academic courses.

For further development, provide criteria to define probabilities of occurrence of accidents are also to be dealt with (e.g. using European Gravity Scale, Bradford Disaster Scale...).

Some members were also involved occasionally in investigations of accidents and required access to databases on accidents for comparison purposes.

In addition to these goals, a final objective is to promote transnational cooperation and networking.

### **II-3 Organisation of the work**

Three meetings have been organized until now :

- at INERIS, Verneuil-en-Halatte, France on March 10, 1993
- at Disaster Prevention and Limitation Unit (DPLU), Bradford, UK on June 2-3, 1993
- at TNO, Environmental and Energy Research, Apeldoorn, N.L., on June 20-21, 1994.

## **III - QUESTIONNAIRE ON STRENGTHS AND DEFICIENCIES OF EXISTING DATA BASES (INCLUDING TRANSPORT OF DANGEROUS GOODS) -**

### **III-1 Aims of the questionnaire**

It is currently known that the Seveso Directive (82/50/EEC) related to major accident hazards of certain industrial activities is under extensive revision. In the revised version, emphasis will be given to Safety Management and thus to reporting and investigating incidents and accidents. Recently a proposal of a Directive was issued (94/C 26/08), related to the transportation of dangerous goods. More specific directives deal with emissions, explosions and fires.

In European countries, there are now mandatory requirements for industries to prepare safety cases to comply with statutory regulations of hazardous plants and for competent authorities to assess these safety cases before authorizing the operation of such hazardous plants. Through regular inspections these competent authorities are also involved in identifying the deficiencies in industrial plants.

Insurance companies have to assess plausible accident scenarios, their probabilities of occurrence and the maximum possible effects (worst case scenarios) in order to assess premiums. They require reliable statistics on accidents and reliable data of involved plants and equipment.

Industrial organisations are more concerned with the general policy related to hazard assessment, risk reduction and emergency planning and response.

Universities, consultants, research organisations have generally developed and used physical models and software dealing with emissions, fire and explosions. For the validation of these models and software, they need accident data (accident initiation, sequence and effects).

Considering all these requirements, a proposal for a questionnaire was discussed at the first and second meetings and finalized at the end of 1993. The questionnaire is of a very broad scope and contains a large number of questions distributed in four main areas :

- Details of the responding organisation (8 items, mainly for identification of the general type of business)

- Use of dedicated in house databases (for each database, items were divided into six subsections : general field of application, technical information, main users, practical information, type of data stored, organisation of databases)
- Use of generic databases ; for each database, items were divided into four subsections : general information, frequency of use, aims of the user and evaluation of the performance
- Suggestion for possible improvements for future databases (features to be introduced, areas to be improved, possible participation in a new database).

### **III-3 Progress of work on assessment of strengths and deficiencies of current accident databases**

This questionnaire together with an explanatory letter was distributed by members of the working group in 13 different countries mainly in Western Europe from February to July 1994.

In some countries, the national sample was relatively large :

- In France, the questionnaire was sent to about 300 companies from whom 41 answers were received. These answers were received from consultants, government bodies, industrial firms mainly in the chemical and petroleum sectors, insurance companies and research organisations. Only relevant answers (29) were analyzed.
- In other countries and particularly the Netherlands, 113 questionnaires were sent to FACTS users or others ; 31 answers were received

- In United Kingdom about 40 questionnaires were sent and 19 valid answers received.

In other countries a limited sample was chosen according to the national contacts of the member of the working group. For example in Italy the questionnaire was distributed through the 3 ASI association and, in Finland, to a group of 20 experts in industrial risks.

The questionnaire was also sent to international organisations (CONCAWE, European Process Safety Centre, JRC, Ispra, OECD, UNEP).

Considering this global sample, caution must be taken when looking at the applicability of the conclusions to a given country or to a particular group of users.

A preliminary assessment of questionnaires received by TNO, Environmental and Energy Research was presented by M. BRASCAMP at the third meeting in June 1994. The general methodology proposed with some amendments was then applied to the 93 questionnaires at the DPLU in August-September 1994.

The initial assessment of these questionnaires will be reported on another paper.

It must be emphasized that, owing to limited allocation of time and funding, only the most salient aspects were investigated and more in-depth work is required.

#### **IV - FUTURE WORK -**

The above mentioned initial assessment of questionnaires demonstrates the existence of more than 85 databases but can give only broad ideas for the future development of

databases. Such improvements as the means for collection of data, the definition of accident scenarios and users friendliness were frequently pointed out.

Provided this assembly approves that we proceed, it is proposed that the next step of our working group "AA" should be to produce a directory containing information on pertinent databases such as their nature, special features, usage, availability and cost. All interested parties will be invited to send this information according to a defined protocol.

This step should assist the harmonization of existing databases and would facilitate the final goal of networking of these databases which would also need a choice of compatible computer systems.

Arising from previous contacts of members with organisations of Central and Eastern Europe and Russia, the working group is ready to cooperate with representatives of these countries ; this will require an additional work. However, available funding from CCE would facilitate such an extension as it would help promoting the development of a harmonized safety policy throughout Europe.

**Working group "Accident analysis"** (20.6.1994)

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