Accident Analysis Benchmarking Exercise Workshop
Summary of the Exercise and Workshop Objectives

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Presentation Outline

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Introduction and Purpose: The JRC Accident Analysis Benchmarking Exercise (AABE)

Background

- **The JRC eMARS reporting system and accident analysis products**
- **The AABE Workshop 2015**
- **The Accident Analysis Benchmarking Exercise – 2015-2018**

The AABE Workshop 2018

- **Purpose of the workshop**
- **Role of participants**
- **Expected outcomes of the workshop**

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Introduction and purpose : JRC Accident Analysis Benchmarking Exercise

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Who We Are

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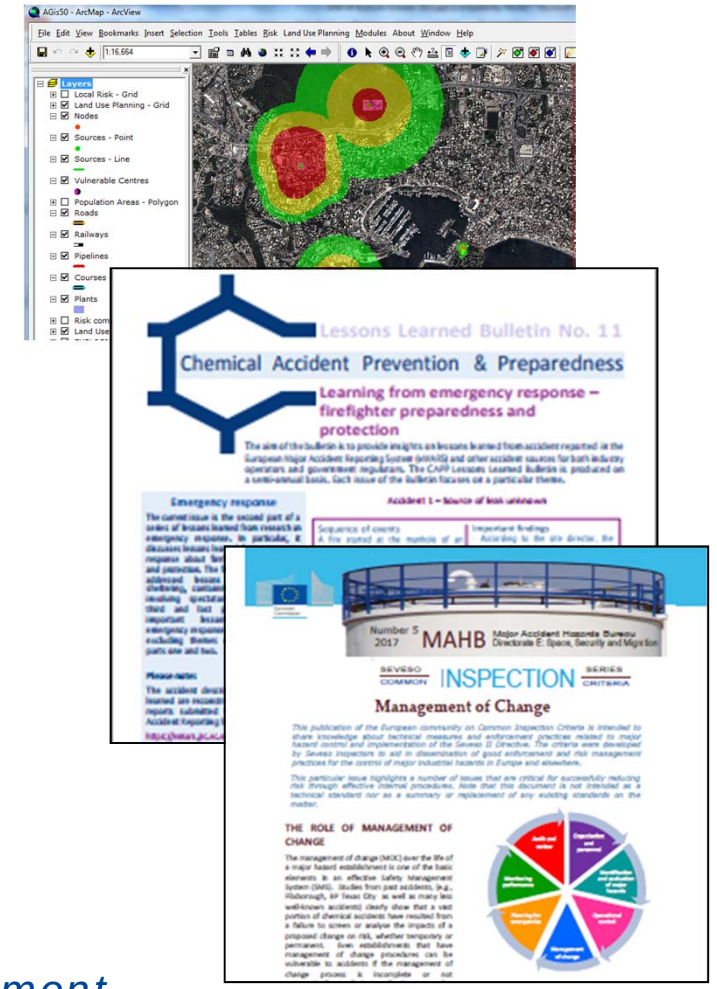
The JRC's Major Accident Hazards Bureau (MAHB) focuses on **industrial accident prevention** and works closely with Techrisk on Natech prevention and preparedness.

We work support **EU policy on environment, civil protection and CBRN.**

We work with **EU Member States** to implement **the Seveso Directive** for the control of major chemical accident hazards.

We work with **international bodies, and third countries** to support improvement in **chemical accident prevention and preparedness** globally.
We specialise in:

- *accident analysis for lessons learned,*
- *risk analysis, and*
- *exchange of good practice for risk management and risk governance*



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The JRC eMARS database

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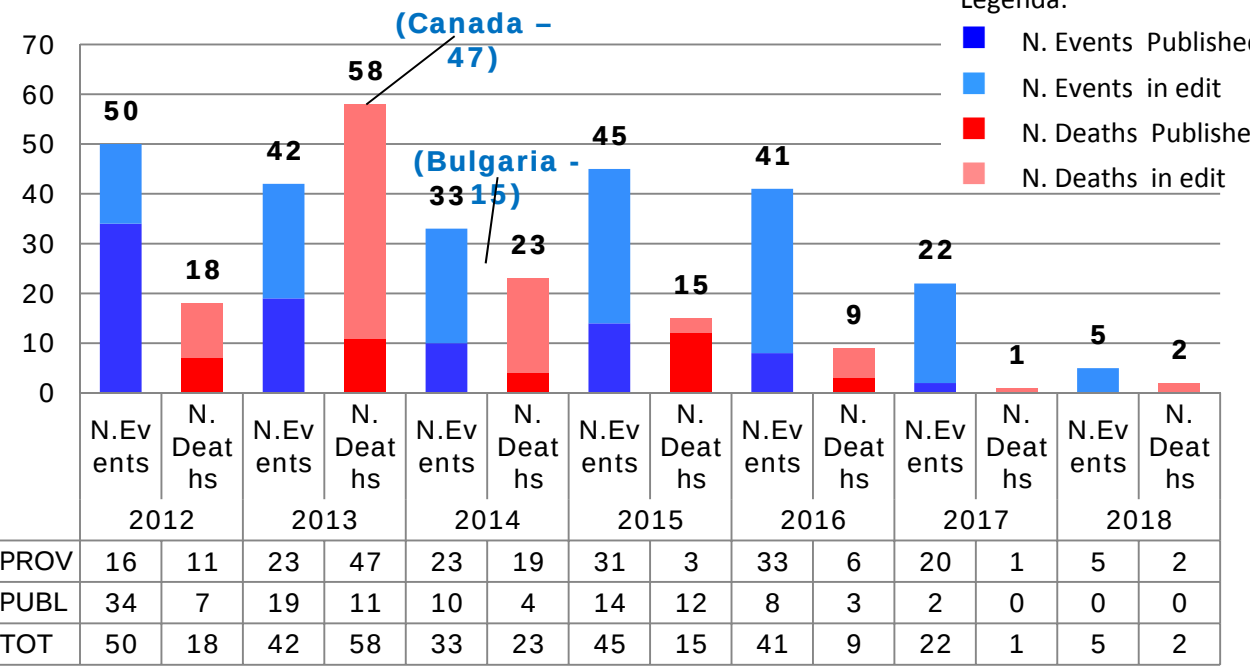
The JRC has collected major and near miss chemical accident reports from EU Member States since 1984 starting with the first Seveso Directive

Total accident reports = 1106

Major accident reports = 869

eMARS: Total events and deaths in 2012-2018 frame *



	2012		2013		2014		2015		2016		2017		2018	
	N.Events	N. Deaths	N.Events	N. Deaths	N.Events	N. Deaths	N.Events	N. Deaths	N.Events	N. Deaths	N.Events	N. Deaths	N.Events	N. Deaths
PROV	16	11	23	47	23	19	31	3	33	6	20	1	5	2
PUBL	34	7	19	11	10	4	14	12	8	3	2	0	0	0
TOT	50	18	42	58	33	23	45	15	41	9	22	1	5	2

*** includes "near misses" and "other events"**

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JRC accident analysis products

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The JRC fulfils the European Commission's obligation (under the Seveso Directive) to disseminate lessons learned from eMARS data. (It also uses many other sources.)

Emergency response – Lessons learned bulletin series

Evacuation, Shelter-in-place, etc.

Fire fighter casualties

Successes and failures

It also conducts analyses as part of special studies or data and collects data to monitor chemical accident trends.

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How lessons learned get into the eMARS database

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Major accident occurs on Seveso site

Investigation and analysis

Operator

and/or

Inspector

(Sometimes other bodies)

Investigation report

Reviewed by Inspector

Member State report

Summarised in eMARS report

The MAHB's target for AABE output

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The AABE was launched with a workshop in 2015

The purpose of the exercise was to

- apply selected analytical methods to chemical accident case studies
- evaluate them in terms of the types of information they help to generate, user-friendliness, and other relevant strengths and weaknesses associated with their application.

The results of the benchmarking would be used to produce **a handbook for the chemical process safety community** in reviewing, analysing and communicating the results of accident investigations.

The Exercise

The main objective of the exercise was to compare the results produced by application of different accident analysis methodologies (selected by participants) to analyse a past accident (or possibly, more than one accident).

Expected Outcome

A **final workshop hosted by the JRC to present results** of each team's results in applying different methodologies.

A **handbook on accident analysis for safety experts who require guidance** in performing accident analyses, generally, or in terms of methods that can be applied to address specific types of cases and problems.

It is hoped that **this handbook will be broadly useful to government and industry stakeholders.**

Outcome of 2015 workshop

6 teams (out of originally 11) remained active and completed the exercise.

Since every team was a “volunteer”, this was a great result.

All but one team could make it here today.

The teams

Team	Accident	Methods
1	Shell Moerdijk	CAST, Accimap, Storybuilder
3	Toxic cloud in Belgium	BARPI’s Method – ARIA 3
4	BP Texas City	Organisational Analysis of Safety
6 Nuclear	Fukushima (Natech)	Fault Tree, Event Tree
6 Chemical 1	Cosmo Refinery (Natech)	STEP, Event and Causal Factors Charting, Barrier analysis on a Tier-based sorting
6 Chemical 2	JX Refinery (Natech)	STEP, Fault Tree, Event Tree, MTO
7	Buncefield	STEP, Tripod Beta, Accimap, CAST
8	Tianjin	Bow Tie, Accimap

How the exercise was conducted

The exercise was focused on analysis and divided into 3 phases:

- Phase 1: Sequence of events
- Phase 2: Direct causes
- Phase 3: Underlying causes

Teams could apply the same model, or different models, for each phase. Main objective was to obtain input on how well the model addressed each phase and why.

Participants agreed on a very loose schedule for completion

MAHB and advisory team created two templates for team reporting

- Template to describe experiences (Originally divided by Phase, but later unified into one table)
- Methods Evaluation Table

MAHB held two conference calls and communicated by email with the group every 3-6 months.

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Results

Two teams reported completing the exercise by mid-2017 (Team 6 and Team 8)

Four teams reported completing the exercise in 2018 (Team 1, 3, 4, 7)

Thank you and good work!

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The AABE Workshop 2018

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Purpose of the AABE Workshop 2018

1. To **compare results of the exercise** and identify important findings about the analytical process and methods used
   - Things that worked
   - Things that worked less well
   - Limitations (information available, methods)
   - Strengths and weaknesses of different methods

2. How can these techniques guide us in developing a handbook for safety experts on accident analysis?
   - What could such a handbook look like? What would be the scope, framework, tips and mini-tools?

3. Other **possible information gaps** related to accident analysis generally or specific methods that could be a **future collaboration**?

Potential workshop output in regard to Objective 1 (General findings)

General findings about analysis and methods (example)

- Sometimes the investigation report did not have enough information to analyse certain aspects
- The output of barrier analysis type methods (Bow-tie, barrier analysis, Tripod Beta) can be a good foundation for systems analysis

General observations of this nature could give us some insight into what could be contained in the handbook.

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Conceptual proposal for a Handbook (Objective 2)

For discussion in Sessions 3 and 4

- No recommendation of any specific methods.
- Handbook is based on Principles of Analysis, that build from basic information gathering (sequence of events, actors) to more complex principles of analysis using systems and organisational analysis
- For each principle, there are suggested techniques for applying the principle
  - These techniques could be simple explanations or they could be mini-tools
  - Some “mini-tools” might be based on experiences using the methods
  - Or we could invent new ones …

Example – Handbook Structure

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Handbook Sections

1. **Principle: Establish a timeline** (Note: Each section should explain why the principle is important)
   Techniques to use: Use a STEP chart in which actors are associated with events. You can use Excel for this.

Example: STEP chart

...

?. **Principle. Everything is part of a system, Part 1.** Looking at the links with the internal system of the organisation.

?. **Principle: Everything is part of a system, Part 2.** Looking at the links with external factors (authorities, associations, suppliers, regulations, etc.)

Etc.

Potential workshop output in regard to Objective 3 (Other information gaps)

Other possible information gaps related to accident analysis generally or specific methods that could be a future collaboration

Example

- Some methods do not have robust training resources (e.g., Accimap). Can something be done about that?

This is what I propose to talk about.

Does it make sense? Is it clear?

Anything that you feel strongly we must mark for discussion in one of the later sessions?

It's important that the objectives make sense and are clear. They can be rephrased or modified to help us all understand them better.

Thank you for your kind attention!

Please come visit the Minerva web platform for resources on chemical accident risk reduction

https://minerva.jrc.ec.europa.eu/en/minerva