DE LA RECHERCHE À L'INDUSTRIE

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GAP analysis
From scenarios to needs in explosives detection

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Outline

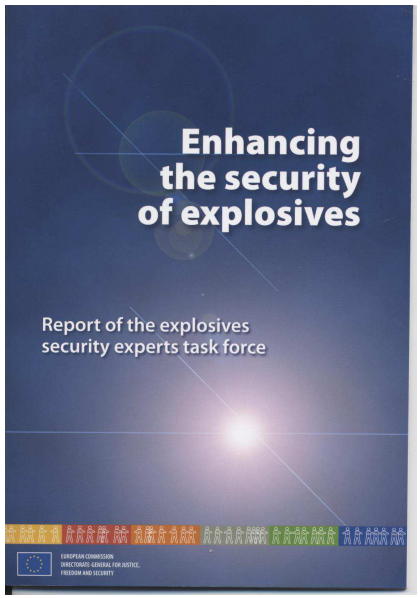
- Introduction-Objectives
- Methodology of the study
  - rough scan analysis
  - scenarios
  - detailed analysis
- Example
- Conclusion

Introduction-Objectives

Action plan on enhancing the Security of Explosives

Establish a scenario-based approach to identifying work priorities in the detection field

No.	Measure/Action	Status/Observations
3.1.1	**Set up a working group tasked with developing and discussing detection related scenarios, and then identifying detection technology requirements for the scenarios while taking into account existing work in other fora.** The working group would be composed of Member State and Commission representatives.	Task Force Recommendation No. 23
3.1.2	***Create a matrix concerning what is desired and what is currently possible in terms of the detection of explosives for each of the scenarios created by the working group.*** The Sanding Committee of experts on precursors will look into the possibility to determine precursors which could be added to the abovementioned matrix.	Task Force Recommendation No. 24



Introduction-Objectives

Scenario description from Matrix group

Terrorism time line

Planning and financing

Obtaining material

Prepare and produce

Transportation

Execution

Matrix scope

Preparation phase

- *Detectable IED component*
- *Location of components or activity*
- *Amount of explosives or precursors*

Vector/target phase

- *IED size*
- *Means of delivery*
- *Primary impact type*
- *Target type*
- *Situational control*

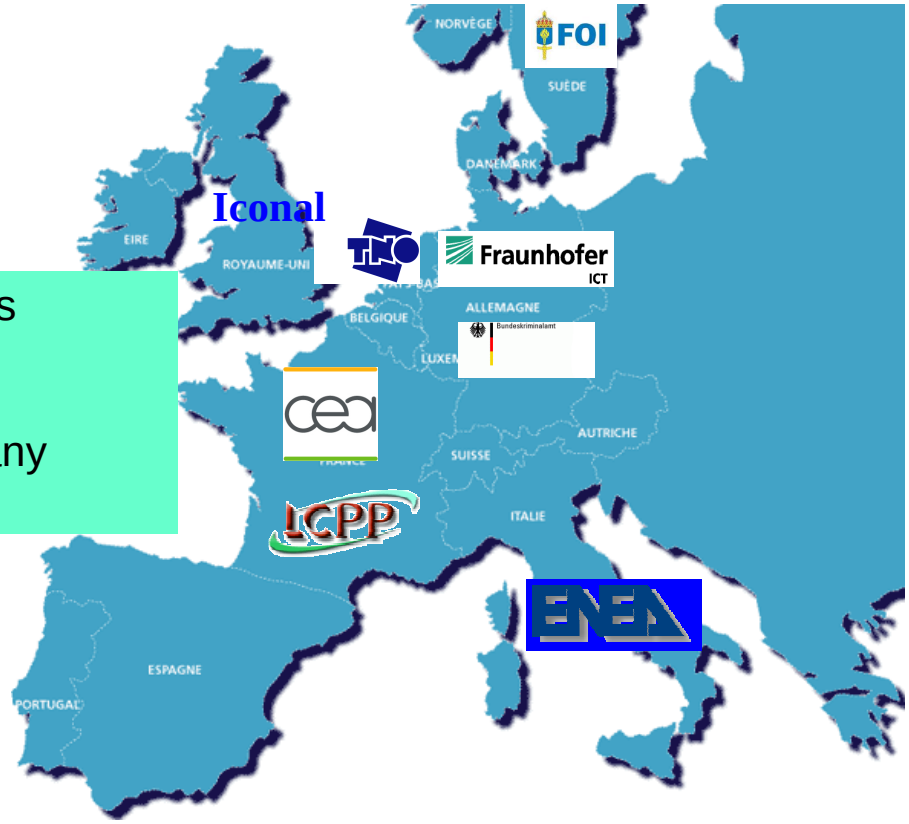
105 high level description scenarios
Preparation phase:9
Vector/target phase: 96

Introduction-Objectives

Objectives:

- **to identify the GAP between scenarios and commercially available detection technologies.**
- **support to UE for identifying the future needs in research for explosives detection.**

Request of DG HOME to NDE

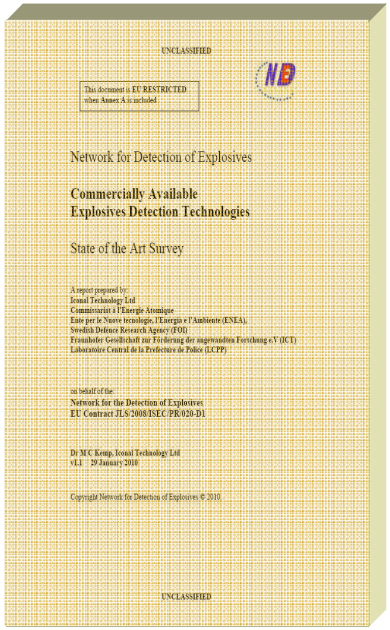


- 5 research institutes
- 2 law enforcement agencies
- 1 consulting company
- Coordinator: CEA

- 6 countries, 8 members
- No providers solutions
- Up to Secret UE

Methodology

- Study based on commercially available detection technologies



Detection Technologies

- *Description of 34 detection technologies*
- *Physical principles, capabilities, maturity, cost*
  - *Anomaly/imaging*
  - *Trace*
  - *Stand-off*
  - *Bulk*

- Rough scan analysis
- Detailed analysis

Methodology: rough scan analysis

- Based on Matrix scenarios. Some factors are not described
  - kind of explosive to be detected
  - weather factors
  - the way the technology is deployed
  - type of packaging or concealment
  - time of day
  - indoor or outdoor situation
  - surrounding situation (e.g. lot of people around, city or rural area,…)
- Combination 34 technologies/105 scenarios
- Scored the detection technologies by relevant or not (R)
- R: means that the detection technology might be sufficiently reliable to enable authorities to decide on the next step.
- Overall assessment per scenario: acceptable global detection solution (number of detection solutions)
- ~ 900 combinations are relevant (R)
- some scenarios are not covered

Rough scan analysis gives an overview of the capability of technologies to detect explosives for generic scenarios. More knowledge on scenarios is necessary to evaluate precisely the possibility to use a technology to mitigate risk (different ranges).

Methodology: detailed analysis

Element	Options/Contents
Likely type of explosive	HME, commercial, military, precursors
Mass of explosive	In line with masses given in by matrix group
Detonator present	Amongst others important for anomaly detection techniques
Exact means of delivery	Gives information about concealment, etc.
Speed	This indicates the speed of the vector
Environment	This gives information about the expected interference
Situational Control	Specific information about the kind of situational control
Description of target	This gives information about the target

Methodology: detailed analysis
120 detailed scenarios

Public security (stadium, crowd, public building,…,)
50

Mass transportation (railway, subway,…)
17

Aviation
(air cargo, checkpoints,..)
13

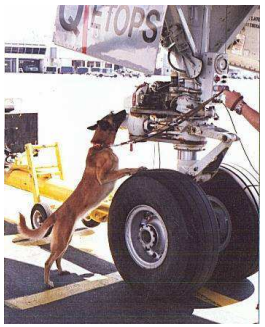
Maritime (port, sea,…)
14

Critical infrastructures (administration, industry, power plant,…)
12

Intelligence/Forensic
14

Methodology: detailed analysis
Technology aspects

Detection Technology Aspects	
1	Range of E (not for anomaly detection)
2	Concepts of operation
3	Stand-off Capability
4	Health and safety aspects
5	Reliability/Technology maturity
6	Cost
7	Time for result
8	Estimate False Alarm Rate
9	Estimate Detection Rate
10	Applicable any time of day
11	Susceptibility for weather conditions



Methodology: detailed analysis
Scoring

Scoring (fictional data)

Technology xx Scenario Txx-1	Score	Weight factor	Weighed score	Comments
Range of E	95	0.1	9.50	Almost all E
Concepts of operation	15	0.1	1.50	Difficult to operate
Stand-off Capability	5	0.2	1.00	Close contact necessary
Health and safety aspects	100	0.1	10.00	Completely safe
Reliability/maturity	80	0.1	8.00	Mature technology in this scenario
Cost	30	0.05	1.50	Relatively cheap
Time for result	95	0.15	14.25	Fast
Estimate False Alarm Rate	50	0.1	5.00	
Estimate Detection Rate	50	0.1	5.00	
Applicable any time of day	100	0.0	0.00	Can be used day and night
Susceptibility for (weather) conditions	75	0.0	0.00	Not very susceptible for weahter, just for temperature
Total		Fixed for a scenario	**55.75**	

Methodology: detailed analysis
Thresholds

- Threshold 1:

  - To exclude technologies which are not applicable to the scenario: safety, concept of operation,…
  One score=0 means that the technology can't be used: final score=0

- Threshold 2:

  - Final score>0 but limitations for some parameters: range of explosives, detection performance: this technology can be used but has severe limitations: partial solution.

Detailed analysis: results

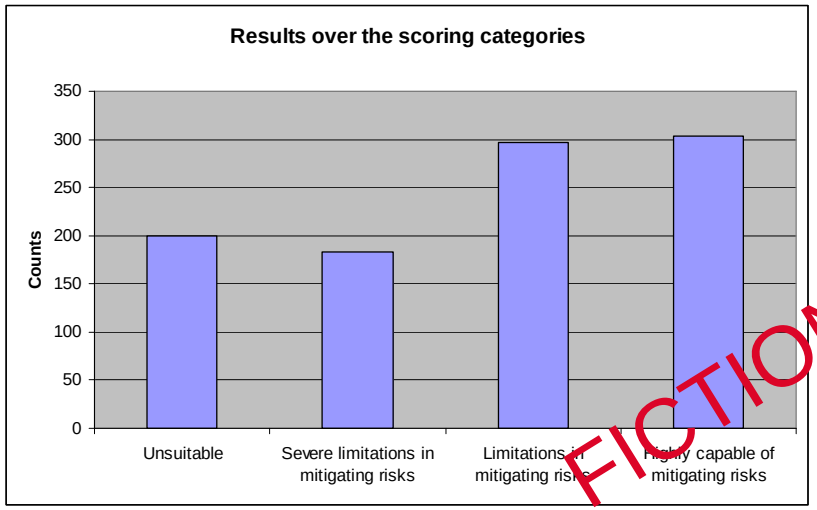
34 technologies, 120 scenarios

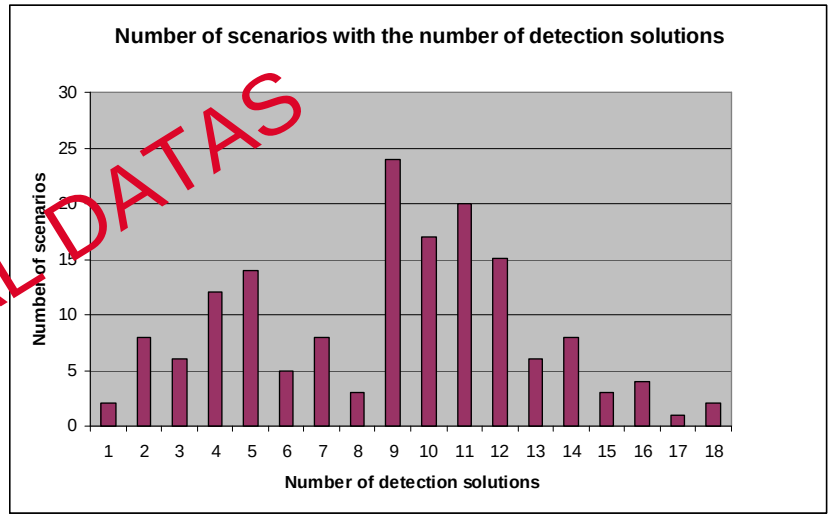
983 combinations (impossible configurations excluded (rough scan analysis))

Description	lower limit	upper limit
Unsuitable		0
Severe limitations in mitigating risk	>0	50
Limitations in mitigating risk	>50	80
Highly capable of mitigating risk	>80	100

Detailed analysis: results

- General results: distribution per category (4)
- Results per scenario family (aviation, public, …)
- Number of detection technology per scenario
- Impact of speed, situational control, threat mass on the detection





FICTIONAL DATAS

Guidelines for the configurations (scenarios) and parameters which need detection technologies research.

But…
results are classified

Conclusion

- The gap analysis is intended to be used and can be used by the EU as **guidance to identify work priorities** in the field of detection of explosives

- The **detection technology** should be considered as a **contribution** to solve a security problem in a given context. That means that even if high scoring technologies are identified within a certain scenario, that does not necessarily mean that the security gap is solved.

- NDE recommends to prioritize the Gaps
  - suggested approach: to prioritize scenarios based on the assessment of the threat in combination with the existence or absence of viable detection technologies, which can be employed to partially mitigate the threat in that scenario. As such, the need for detection solutions in certain circumstances would be articulated. Next, the potential of developing, innovative solutions should be studied and **translated into a detection technology development roadmap.**
  - Apply the same approach to known emerging detection technologies: this would enhance the understanding of the potential of innovative explosive detection technologies to augment the roadmap and provide additional capabilities.

Acknowledgements:

TNO, BKA, FOI

DG HOME

All of you for your attention

Questions?