



European Train the Trainer Programme for Responders

Fuel Cells and Hydrogen Joint Undertaking (FCH JU)
Grant Agreement Number 875089

VR Exercises an Introduction for Trainers

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Version: 210615

Dissemination level: Public

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Acknowledgments

The project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (JU) under grant agreement No 875089. The JU receives support from the European Union's Horizon 2020 research and innovation programme and United Kingdom, France, Austria, Belgium, Spain, Germany, Italy, Czechia, Switzerland, Norway.



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Summary

This document presents the use of Virtual Reality (VR) Exercises and related material available on HyResponder online platform.

It should be noted that what is on the platform is simple recorded videos, rather than VR. In order to use VR, a VR training platform has to be used. It is not possible to have a responsive, interactive VR server running with free access on the HyResponder e-Platform, nor is that the purpose of the platform. However, this document and the videos serve as an introduction to VR capabilities and readers are encouraged to contact CRISE (info@vr-crisis.com) to discuss further.

In case your training centre has such a platform, we will present the different methodologies that can be used with a VR platform for H2 training.

All of the methods presented here can be accessed on-line using the simulation infrastructure at ENSOSP. ENSOSP have developed VR based online training for H2. All exercises that are downloadable from the site can be fully exploited through VR via distance access to ENSOSP. In addition, the exercises described on the platform are examples taken from a much wider range of training exercises available with full VR capability.

Finally a simple method will be presented outlining how to use the content accessible from this site.

Keywords

Virtual Reality, Training, Andragogy, on-line VR, Tabletops, Drills, Functional Exercises.

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1. CRISE presentation

CRISE company developed EVE (Exercising Virtual Environments) back in 1996. Since then the concept of VR based team training has been evolving both technologically and in application fields.

The first application of EVE targeted wildfire officers training, and was running on a 40 computers cluster serving shared VR for 18 users. Nowadays, a single tabletop computer may serve much more dynamic and rich VR environments for each user, and, applies to both natural disasters, man made disasters, CBRN or CT trainings, to name a few.

Our clients typically are emergency management people, ranging from operational responders, tactical officers, or strategic leaders, from public, private or military sectors, in Europe, Asia, Africa and Americas.



Our clients.



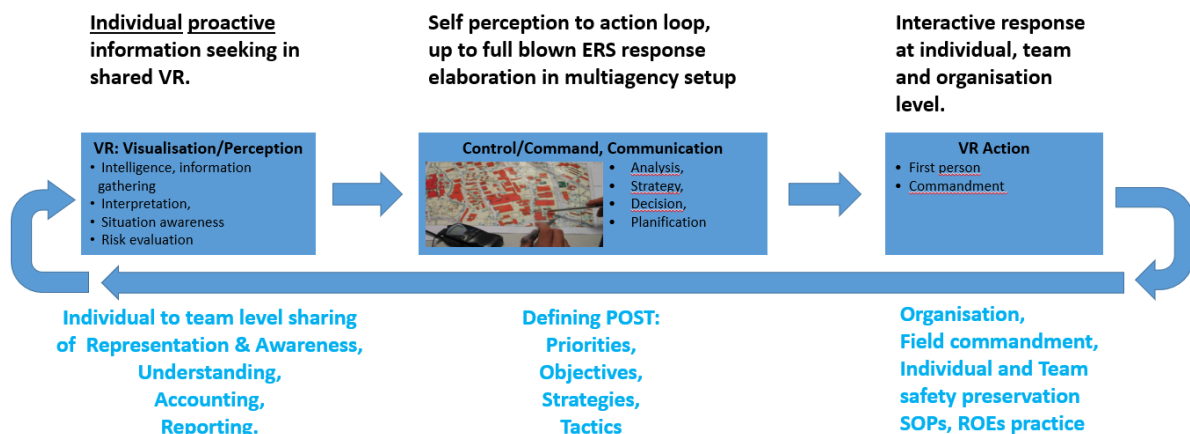


1.1 CRISE and H2 related trainings

CRISE started to provide Hydrogen training materials with the HyResponder project aiming at training first responders to Hydrogen risks in June 2013.

CRISE developed, with ENSOSP, a French fire fighters officers training school, a full suite of training materials dedicated to this.

1.2 CRISE Training concept:



Each member of a team is immersed with his teammates into a virtual environment, in which they can choose their EPI, and use the available vehicles, crews and equipment to communicate (virtual operational radio supported), measure (from explosimeters to high end chem sensors), evaluate the situation, act upon or develop action plans.

In this framework, each participant may develop his own situational awareness, then develop a group level awareness and tactical planning, using communication equipment. The virtual system is interactive and will take into account counter measures, actions, and will eventually -virtually- harm the participant if danger exposure is detected, wrong personal protection equipment or ROE non observation.

This approach can be applied to any level of commandment, from operations (field), to tactics (ICP) or strategic (ERS), to manage incidents or crises.

- Analysis and understanding of situations
- Strategic, tactical and operational practice
- Decision under stress situations
- Individual & Team awareness management
- Procedures enforcement
- Commandment and operational management
- Organisation resiliency and safety
- Leadership

Education

Learn

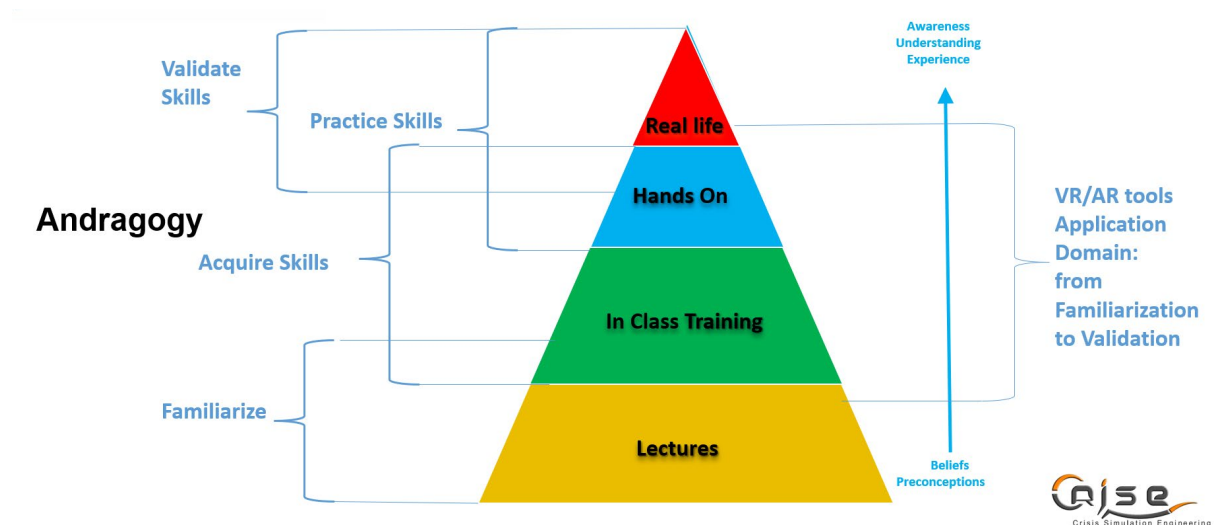
**Acquire and
Maintain skills**

Train

**Evaluation and
validation**

Qualify

2. Andragogy



Pedagogy is used for children. Adults have a different approach to learning and acquire skills. Andragogy is just about this.

According to Knowles (1984) there are four principles that are applied to **adult** learning:

1. Adults need to be involved in the planning and evaluation of their instruction.
2. Experience (including mistakes) provides the basis for learning activities.
3. Adults are most interested in learning subjects that have immediate relevance to their job or personal life.
4. Adult learning is problem-centred rather than content-oriented. (Kearsley, 2010)

Virtual Reality based team training reaches these goals.

1. Trainees are facing virtually the same kind of problems they are facing in real life, so they can, even themselves, evaluate their instruction, and plan it, for, they are aware and presented with their improvement points.
2. Trainees may, both by themselves, or in group, experience the approach for problem solving. Mistakes are possible, though they are not simply harmless. So VR can be used for qualification. Commandment errors, SOPs errors, ROEs errors are as noticeable in VR as in reality.
3. Training in their -virtual- every day working environments is definitely relevant to their job and personal life, in the full extent of the meaning of it.
4. And, of course, immersion in VR is designed to provide problem solving training

In the following pages we will present some VR based approaches, that have been developed for hydrogen.

3. VR Training methodologies

These presented methods are not available in the provided training kit, for they rely on CRISE simulation framework to be used.

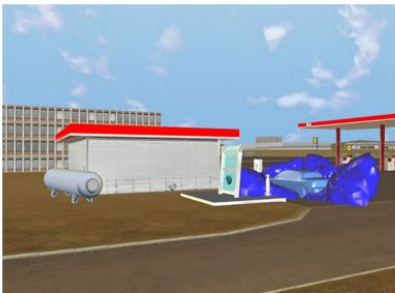
All of these presented setups can be used in ENSOSP premises for Hydrogen training. ENSOSP is ready to offer your teams such training sessions.

Technical support, and animation can be provided on-line for TableTops, drills and functional exercises by ENSOSP. Distance training for teams is possible.

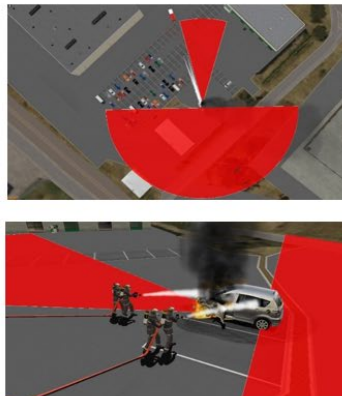
Please contact them if you are interested.

3.1 Illustration, Orientation, familiarisation

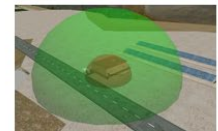
To illustrate lectures, in order to facilitate understanding of trainees, when presented 'real looking' situations in addition to curves, tables and equations. (item number 4 in Knowles Andragogic principles)



Leak at a station: shape of cloud.



SOPs & ROEs



Separation, heat patterns,
overpressure, sound @120dB,
sound detection & danger
distances and surfaces



Items are to be used in the classroom. Typically, they are projected onto a screen, and any trainee may ask to visualize from another angle, and, eventually to perform a measure with any available sensing device available in the VR application. Sound can be rendered too.

We encourage trainers to use a VR package to produce such illustrations. VR allows the free choice of the point of view, and it enables trainees, to explore, hear, measure with sensor devices the 'reality' of the exposed issue. Each trainee experience, or misconception may then be used as a discussion starting point in the group.

Constructive and explicit problem exposure is performed usually by a single instructor in a face to face or face to a homogeneous participants group situation.

Orientation exercises are designed to ‘guide’ the user towards a problem. This should be understood both as an explanation of ‘why’ it is necessary to train to H2 specifics, but, as well, as an orientation towards the different contents of the proposed training. We want the public to be self-directing into following the proposed lectures.

Both the physical and virtual simulators should be used to expose, illustrate, anchor and enforce lectures contents.

3.2 Demonstration and Tabletop exercises (TTX)

VR is used to demonstrate theoretical or doctrinal approaches during lessons. Using TTX, it's possible to honour point 2 and 4 of andragogy principles: a TTX enables to explore new doctrinal or operational approaches and validate the understanding of a chosen doctrine or operational tactics.

Examples:



LH2 dump in supermarket



TPRD release on tilted vehicle



Fire in tunnel



Pipe line incident

TTX are TableTop eXercises



These scenarios are used in the classroom. While illustration/orientation doesn't ask trainees for any decision or SOP tactical choice, in this case, the problem has to be coped with on a class wide cooperation mechanism. This leads to what is called an inverted classroom, in which the trainer mostly orients, evaluates and enforces the explanation of the good or bad choices made by the team.

A TTX is a low-stress event to stimulate discussion of a simulated situation. Participants discuss issues in depth and make decisions using slow-paced problem-solving methods in contrast to the fast-paced, spontaneous decision making typical of actual or simulated emergency conditions. TTXs are designed as an early step along the way to functional and full-scale exercises. Constructive problem solving is the goal of such an exercise.

The scenario is generally invented and describes an event or emergency incident, bringing participants up to a simulated “present moment” in time. From there, virtual simulator may be used to provide the realistic material and vision suitable to describe the subsequent interactive pacing of events decisions and effects. TTX shouldn't be thought as ‘real time’, some events may be accelerated if not conveying interest for the discussion, others may be slowed down in order to expose inner mechanisms, or to simply provide enough time for discussion.

VR is used to provide the realistic material and vision suitable to expose the subsequent interactive pacing of events decisions and effects.

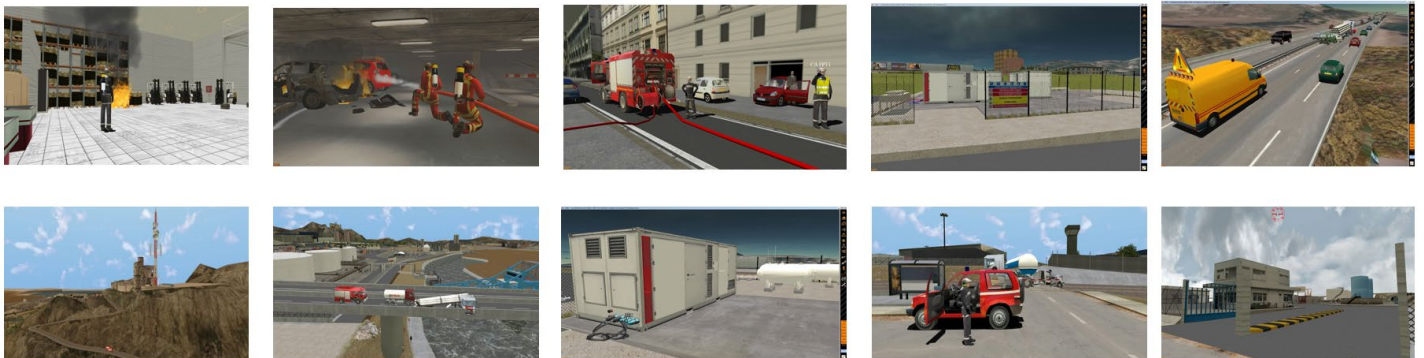
Constructive and interactive problem solving is usually performed by a single instructor face a group of **heterogeneous** participants.

This means it enables to mix different proficiency levels in the classroom, this will enable to expose each participant own experience and all trainees will benefit of the exposure of the problem and its solutions, both proficient and less proficient.

3.3 Drills

VR drills enable comprehension and practice to be gained by practicing numerous short exercises. This enables trainees and teams to face many different configurations of the same event, and to gain experience on how to use SOPs/ROEs, while practicing situational awareness and control.

Examples:



Choose a VR package enabling to perform measures (explosimeter, electrometers, PID, FID, thermometer, IR cam, etc ...)



The main purpose of a drill is to use repetition to instruct thoroughly. Drills can be used to test personnel training, response time, interagency cooperation and resources, and workforce and equipment capabilities.

Another purpose of drills is to put trainees in very different operational environments, implying danger area assessment evaluation in a wide variety of situations. For each identified HyResponder category of concern (automotive, storage, distribution, production, ...), drills enable to test and improve threat assessment through a large number of slightly different exercises. (Automotive in open / underground car park, private garage, in a tunnel, in a city center, ...).

This enables to avoid 'task fixation blindness' by practicing situational awareness at an incident scene, including personnel, team, environment, resources and broad picture. *Drills ought to induce the importance of situational awareness, personal safety, and personal accountability at the incident scene*

Drills optimally take place after orientation and demonstration; staff should have an understanding of the agency function that will be tested in the drill and be given an opportunity to ask questions. Operational procedures and safety precautions are reviewed before the drill begins.

Drill categories include but are not limited to reaction, notification, communication, command post, and evacuation. In most cases, a general briefing by the drill designer sets the scene and reviews the drill's purpose and objectives.

A drill is usually focused on a segmented functional part of a protocol, like 'immediate response', or 'operative answer'.

VR is used to provide shared operational exposure and understanding, to expose the interactive pacing of decisions, actions and effects, and to sustain the drill action with spontaneous or planned events.

Elaborating beyond SOPs: complex situations may put SOPs out of scope. For example, tunnel fires are often demanding to build up an adapted response that may or may not fit with standard procedures, but which should still comply with ROEs. Exploring these situations with trainees, enables to enforce their confidence in their newly acquired competences.

While simple drills ought to be simple and straightforward, to gain SOP and ROE experience, it may be worth introducing more complex exercises, in order to prepare to FSE (Full Scale Exercises)



A complex incident in a tunnel



A complex multi energies vehicles incident

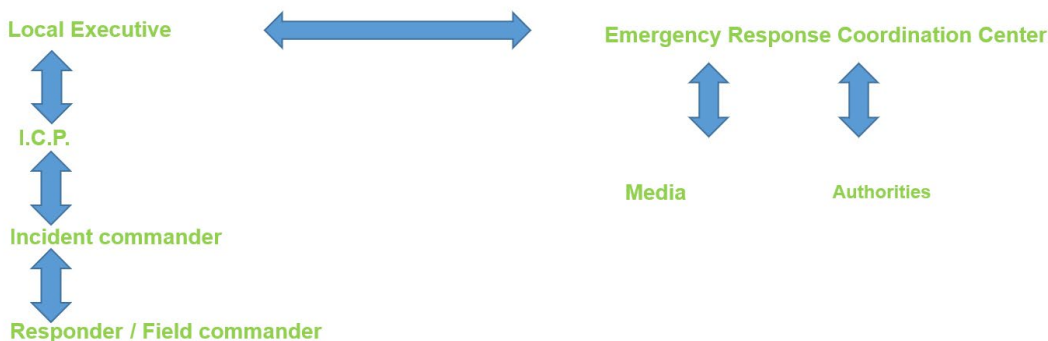
Choose a VR package enabling to generate any scenario that fit your need.



3.4 Functional exercises (FE)

The purpose of an FE is to test and evaluate the capabilities of an emergency response system, or parts of an emergency responses system, interagency cooperation and resources.

Unlike Drills, an FE encompasses more complete system, mixing typically functional and commandment levels, over several first responders' types.



Session director

Choose a VR package enabling to cope with communications (operational radios), in order to have information flow up and down from field operations.



These kinds of exercises are necessary for an emergency management organization to ensure and validate its preparedness as a whole response system, tightly coupled with other concerned organizations in management of a crisis. Typically, functional exercises may involve, besides first responders, one or more whole chain of commands, other organizations, like medics, police forces and other civil servants contributing to the crisis resorption.

4. Presentation of an example of H2 VR training for responders

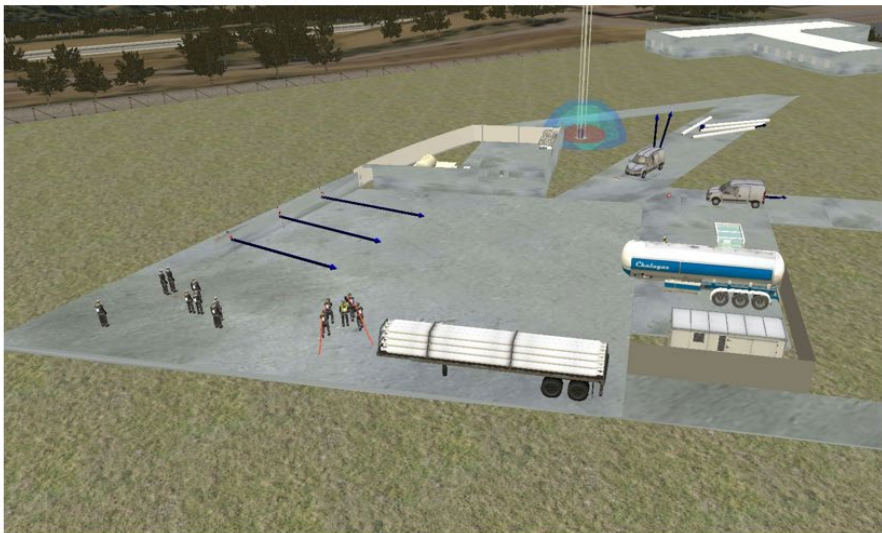
This chapter presents exercises led at ENSOSP simulation infrastructure focusing on H2 risk.

It involved both first responders, officers and experts.

4.1 Real fire platform familiarisation

First use is to familiarize the first responders with the real fire platform *before* sending them experience h2 risk in reality:

Visualising, preparing before full scale exercise.

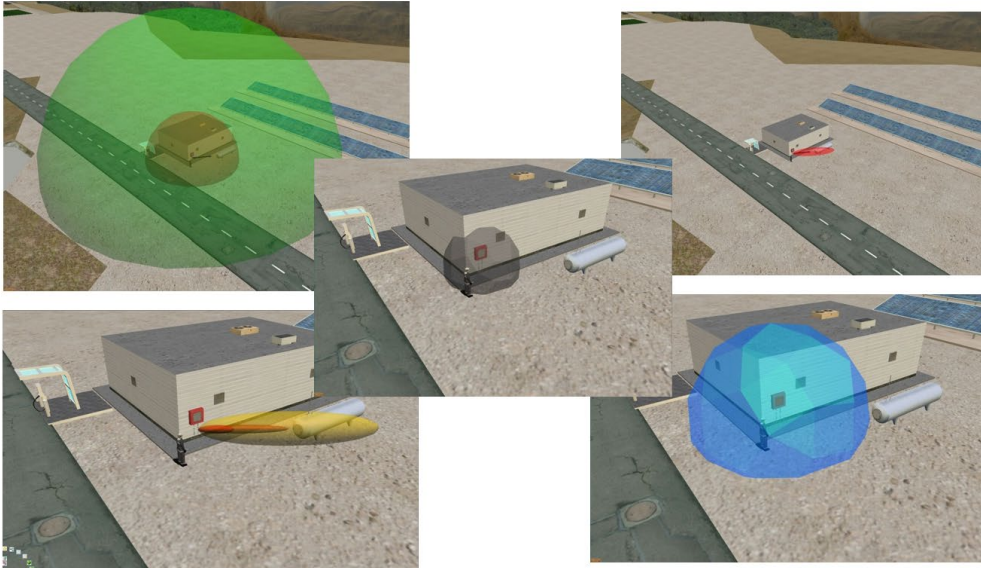


Preparing the real platform session.

- What will be demonstrated
- Why
- How
- Organisation
- Safety rules

4.2 Illustration during theoretical lectures

Lectures are very useful for acquiring a theoretical background, but fire fighter adults often need to visualise the information given in a way that relates to their everyday life (see andragogic principles in preceding chapter). A way to help trainees is to offer them work related representations.



Visualising & understanding: Sound, Blast overpressure, Separation distance, Heat patterns ...



In the same vein, the use of VR for introducing EERG, ROEs, SOPs is very useful to ensure all assistance is picturing the same operations as depicted.



SOPs, ROEs
explanation &
rehearsal...



4.3 Tabletops

TableTops are very useful if trainees have different proficiency levels, group based solution seeking process enables all to gain experience from others, and any mistake is a way to progress as a group. Besides, good solutions never thought of can be found too.



4.4 Functional Exercises

More geared towards the command chain and global ERS training, proposed VR exercise, enable to train from first responders, up to ICP and regional ERS.



Functional
Exercises



4.5 Last but not least: discussions during tabletops, functional exercises or drills



Using VR as a support for free discussion between and with trainees is a very valuable valorisation of VR training sessions.

5. The web video kit freely available online

In the preceding chapters we presented the use of a VR infrastructure to train to Hydrogen risks.

While these exercises can be led on another infrastructure, ENSOSP is ready to organise sessions for your organisation in their premises or eventually, on-demand, as an on-line session, without having to install any special software on your computers.

If no infrastructure is available for you, we provide on this site, recorded videos from VR sessions led in ENSOSP.

5.1 Using the training videos:

Each video is accompanied with a text document that contains useful information to use it as an exercise. These documents are elaborated by ENSOSP to help the trainer present the exercise and to ensure no important item is forgotten.

Exercises can be grouped two by two, by focus, in order to achieve the following timesteps:

- A first exercise targeted to fix the current focus, and to be sure all participants are sharing the same representation of a typical incident along the focus. The exercise is composed of three steps:
 - An operational presentation of the incident, it's surroundings, a risk analysis, done in classroom by playing the video.

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- Then, some groups will be designed, and ventilated in subgroups sessions, for collective reflexion and proposal, at group level. Preventive actions, and timed action plan are expected. POST (Priorities, Objectives, Strategies, Tactics) will be defined by each group. Each group can be assisted by a trainer. (10' duration)
- Then, back to main classroom, elaborated POSTs and comments of each group will be integrated with the presentation of doctrine and EERG about the current topic, made by trainer. (15' duration)
 - Some videos of the real phenomenon and intervention can be proposed (15' duration)
- Finally, another exercise, following the same setup as the first one will be proposed, in order to be sure that presented doctrine and EERG is understood and applicable and, of course shared by participants 'hands on'.