Final Report

Project No: 218070

Project Acronym: CAST

Project Full Name: COMPARATIVE ASSESSMENT OF SECURITY-CENTERED TRAINING CURRICULA FOR FIRST RESPONDERS ON DISASTER MANAGEMENT IN THE EU

Final Report

Period covered: from 01/07/2009 to 30/06/2011

Date of preparation: 31/08/2011

Start date of project: 01/07/2009

Date of submission (SESAM): 31/08/2011

Project coordinator name: Prof. Friedrich Steinhäusler

Project coordinator organisation name: UNIVERSITAET SALZBURG

Version: 1
Final Report

# PROJECT FINAL REPORT

<table>
<thead>
<tr>
<th>Grant Agreement number:</th>
<th>218070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project acronym:</td>
<td>CAST</td>
</tr>
<tr>
<td>Project title:</td>
<td>COMPARATIVE ASSESSMENT OF SECURITY-CENTERED TRAINING CURRICULA FOR FIRST RESPONDERS ON DISASTER MANAGEMENT IN THE EU</td>
</tr>
<tr>
<td>Funding Scheme:</td>
<td>FP7-CP</td>
</tr>
<tr>
<td>Project starting date:</td>
<td>01/07/2009</td>
</tr>
<tr>
<td>Project end date:</td>
<td>30/06/2011</td>
</tr>
<tr>
<td>Name of the scientific representative of the project's coordinator and organisation:</td>
<td>Prof. Friedrich Steinhäusler UNIVERSITAET SALZBURG</td>
</tr>
<tr>
<td>Tel:</td>
<td>+43 662 8044 5700</td>
</tr>
<tr>
<td>Fax:</td>
<td>+43 662 8044 150</td>
</tr>
<tr>
<td>E-mail:</td>
<td>Friedrich.Steinhä<a href="mailto:usler@sbg.ac.at">usler@sbg.ac.at</a></td>
</tr>
<tr>
<td>Project website address:</td>
<td><a href="http://www.castproject.eu/">http://www.castproject.eu/</a></td>
</tr>
</tbody>
</table>
Final Report

Please note that the contents of the Final Report can be found in the attachment.

4.1 Final publishable summary report

Executive Summary

The CAST Project addressed the future needs of the EU First Responder (FR) communities in all 27 Member States facing new threats exceeding the current training assumptions, i.e. Catastrophic Terrorism, Mega-scale technical catastrophes and natural disasters occurring once in a century only. The concept is based on the All Hazards-Approach and focused initially on the evaluation of the current situation in terms of training and equipment. Using this information the consortium designed a standardized modular training curriculum for FR.

In the period 2009/2011 the CAST Consortium has completed altogether thirty three Deliverables with the following main achievements: Creation of the CAST Database on Emergency Response Major Incidents (DERMI); Development of a catalogue on tactical procedures for first responders; Report on innovative methods for enhancing the level of awareness, performance, planning and management of FR; Development of Virtual Reality Threat Scenarios for training purposes for FR, linked to wireless biofeedback; Analysis of Catastrophic Terrorism, deploying weapons of mass destruction, weapons of mass killing and weapons of mass disturbance; Analysis of Boiling Liquid Expanding Vapour Explosion (BLEVE) and modelling of its effects; Creation of a Communication-network of Competence, together with a Database of European Experts on First Responder Issues in order to improve communication between FR organisations; Assessment of the international state-of-the-art of protective gear and personal protection equipment; Report of current best practices on tactical procedures, networking and communication and protection focusing on multi-agency collaboration; Development of an Instructor Supervision Desk software as a tool to provide support for table top exercises for combined training with simulators; Development of the CAST Standardized Security-Centered Training Curriculum for FR, consisting of seven modules and aimed at the middle-management level.

The results obtained in this project will assist FR to decrease the probability of experiencing physical harm in their line of duty, increase their effectiveness in rescuing people and regaining control over an extremely hazardous situation, and strengthening their resilience against psychological trauma due to threats exceeding their daily routine operations.

Summary description of project context and objectives

The EU Member States are faced with an increased vulnerability due to threats resulting from international terrorism, large scale industrial accidents and natural catastrophes with disastrous consequences exceeding their daily routine operations. Consequently, the societies in the EU are in need of first responder (FR) capabilities, which reflect the changed threat situation. These threats include, for the first time, scenarios which can result in damages, health- and environmental risks of a hitherto unprecedented magnitude. For example, the FR community in the EU may have to conduct search and rescue operations, as well as policing and fire fighting after the deployment of a weapons of mass destruction (WMD) by terrorists in an environment contaminated by potentially lethal radioactive, biological or chemical contaminants. Therefore, disaster management skills of the EU FR community need to be adapted to meet these new challenges.

The CAST Project context is reflected in its multiple aims:
* To assess the demands for disaster management for FR in the EU Member States, addressing scenarios of incidents and defining the threats to FRs.
* To assess organisational and institutional background of the various first responders communities in the EU and the consequences for the needs for disaster management
* To assess the current status and training curricula of disaster management in EU FR and compare it with best practices in countries with extensive experience in this topic area
* To identify potential gaps between the current standard in disaster management by FR in EU
member states and international best practices

* To establish virtual reality training systems as a part of FR training programmes and as a tool for comparative assessment of first responders training and awareness.
* To develop a curriculum for a standardized security-centered training course for FR on disaster management in the Member States of the European Union, ensuring a high level of technical education to enhance the implementation of the results of technology based security policies and programs.
* To enable FR to manage the aftermath of a catastrophic terror attack (e.g. after the deployment of a WMD) in a safe and efficient manner
* To strengthen the current response capability of FR to provide their full service also after a very severe industrial accident (e.g., a major uncontrolled radioactive release from a nuclear power plant) or a large scale natural or technical disaster (e.g., large scale flooding after a dam break).
* To provide a tool for resource planning (network of information on demands and on security-related technologies representing the state-of-art with the feature of continuous updating).
* To provide a tool of interface between the demands of the FR-community and the resources of research and development.

The CAST Project had three objectives:
1. To provide all parties involved in FR training with fully comprehensive and trustworthy information on state-of-the-art methodologies and equipment concerning security threats to the FR community, protection of members of the FR community, and disaster management by the FR community;
2. To assist in exploiting Europe's scientific and industrial strength by developing a security-centered standardised training curriculum on disaster management for FR, meeting highest quality standards, and enabling the FR community in the EU to perform their challenging tasks also in the new security environment of catastrophic terrorism, in addition to threats resulting from major technical and natural disasters;
3. To overcome the current differences in training of first responders on disaster management in different EU member states by strengthening the first line of defence in a cost efficient manner due to avoiding duplication and optimising interoperability between FR groups.

The standardised training curriculum on disaster management developed for the various categories of FR provides European emergency services and crisis management with a strategic advantage in their efforts to provide an optimum level of security to citizens.

The CAST Project emphazised innovation through the following conceptual design:
* A new comprehensive and integrative approach for identification of new threats leading to enhanced awareness and preparedness
* A standardised security-centered European curriculum providing enhanced interoperability
* Introduction of the most advanced software-technologies for interactive training and education, such as computer-based Virtual Reality (VR) and wireless biofeedback, which can be used as a tool for comparative assessment of first responder training programmes in different EU-member states and different organisations.
* Integration of tools for enhanced interoperability based on a new approach of network-software, together with a standardised network of information on demands and on security-related technologies representing the state-of-art with the feature of continuous updating.

Throughout the implementation of the CAST project the consortium cooperated closely with dedicated specialised organisations representing the FR community (i.e. paramedics, fire fighters, military), members of the security research community (universities, research centres), and representatives of the industry. This ensured that the products of this project were not only tailor-made to meet the current needs of the FR community in disaster management, but also ensured that they represent state-of-the-art in terms of didactics and technology used in the field exercises and computer simulation of threat scenarios.

**Description of main S & T results/foregrounds**

Including the socio-economic impact and the wider societal implications of the project so far) and the main dissemination activities and exploitation of results.
1.3.1 WP 1 (ISCC)

WP1 had to provide 3 deliverables:
* A database on emergency response to major incidents
* An assessment of current status of FR training on disaster management
* A catalogue on tactical procedures

Database on Emergency Response Major Incidents (DERMI).
The database is designed as a training tool in terms of Lessons Learned from terrorist threats, large scale industrial accidents, and natural catastrophes. DERMI provides the first comprehensive in-depth analysis of the strengths and weaknesses of initial response by first responders answering to a Call for service in extreme situations. The database has been updated continuously and contains 110 entries in the second edition. It is designed as a source of information concerning responding actions of first responders in case of disaster management. It deals with incidents of terrorism, industrial accidents and natural disasters. More than half of the incidents occurred after year 2000 and more than 75% after year 1990. Older incidents have only been included because of uniqueness. Geographic distribution shows approximately two thirds of the incidents having occurred within EU (35%), US (20%) and Russia (21%). This was important for comparative analysis of best practice within these regions, as it was intended from the start of the project. Types of incidents have been divided into 8 categories, regardless of natural or manmade origin: terror attack (33%), explosion (22%), traffic accident (18%), natural disaster (11%), radioactive/nuclear incident (10%), chemical release (3%), structural collapse (6%) and other (7%).

The database is based on the software FILEMAKER PRO. Filemaker provides a lot of flexibility to arrange, sort and analyse data. Text-search can be conducted within all fields.

Information has been extracted basically from open-source literature. This comprises Incident Investigation Reports by International Organisations and National Commissions, Incident Operational Response Reports by Emergency Services, Scientific Papers in Reviewed Journals, Subject-Matter Books and Monographs, Papers and Articles in Non-Reviewed Periodicals and Professional Magazines, Reports in Newspapers and Online News Agencies.

The database is concentrating on information about response characteristics for each responder group. This information is mostly descriptive and not numerical.

In principle the FILEMAKER Pro software is supporting numerical analysis. If somebody wants to extract data-fields for statistical analysis, the functionality is provided.

UDB has carried out for example "semantic data analysis", which is provided in Deliverable 2.1.

Catalogue on tactical procedures for first responders
D1.3 depends on information of deliverables 1.1 and 1.2., as well as of deliverables from work package 3.

It was decided to take the approach of PSNI-incident management as a base for a general approach to the development of tactical procedures. The main idea behind this approach is the following conclusion, which is the result of systematic assessment of disaster response.

With this structured approach the DERMI-database has been analyzed to extract instructive cases concerning tactical procedures for each of the specified task areas.

14 categories of tactical procedures have been extracted, finally: emergency planning, dispatch of personnel, arrival on scene, decision on acceptable risk, scene assessment - information management, command post, perimeter zones, crime scene, priority of responding actions, scene management, search and rescue, evacuation, triage, information of public.

By drawing conclusions from the deliverables of work-package 3, dealing with catastrophic terrorism, guidelines for real first responders in the initial stage of an incident of catastrophic terrorism are provided, which contain tactical procedures upon arrival at a nuclear WMD-suspected site, radiation incident-suspected site, biological or chemical WMD-suspected site.

Drive to Ground Zero: This section gives information on tactical behaviour while approaching ground zero.

Area Surrounding Ground Zero: This section provides a guideline for tactical behaviour in a hot zone and determination of no-go areas.

Turn back-decision: This section provides a guideline on decisions related to self-endangering of the first responders with respect to exposure-limits depending on dose of radiation or chemicals.

For each scenario there is a further supporting section dealing with Practically Applicable Tactical Response. In these sections the tasks for incident commanders and tasks for first responders are
Response to Catastrophic Terrorism has to follow a "strategy of turn-back-wait for assistance with better PPE and special knowledge".
For this strategy a central element is a guideline for turn-back decision:
For Scenarios like a crude nuclear bomb a no-go zone and a hot-zone will have to be established. For a toxic scenario: state-of-the art NBC-protection will provide sufficient protection and no turn-back-decision will be necessary. Only if incident with fire and risk of BLEVE and Domino effects -turn back decision would be crucial. As this is only likely at industrial sites- a good emergency planning should provide sufficient decision tools (Seveso-II-directive).

Report on current training-programmes on disaster management
The objective of this report is to provide a basis for the development of the standardized training curriculum for first responders in the member states of the European Union within the frame work of the CAST project (WP 9). This report contains the assessment of the answers to the CAST questionnaire and analysis of DERMI-Information. Altogether 80 replies, covering 25 EU-Member States, have been analyzed. All of the organisations which have been asked are related to the first-responders community. Most of them are typical first responder organisations, with a majority representing emergency medical services (EMS) and fire-fighter (FF) organisations. Some organisations act more as authorities for civil protection and on a general planning or educational level or act as supporters of first responders on a national level. They will be referred to as Civil protection organisations (CPO).

Questions covered the following topics:
Responsibilities in scenes of terror-attacks
Emergency Guidebook: The contents are regarded as a reflection of threat and risk assessment and cover issues concerning initial steps on emergencies (e.g. approach to incident site, initial surveillance of incident site, communication and information management), issues concerning control and management operations (e.g. methods to size-up an incident scene, how to relay information to officials, how to maintain control at disastrous industrial accidents), issues concerning tactical emergency care (e.g. care of ballistic and missile casualties, care of blast and burn casualties, care of chemical casualties, care of biologic casualties, care of nuclear casualties, tactical evacuation, evacuation care, tactical triage, biological agent protective measures, radioactive agent protective measures, fluid and medication)
Protective equipment: Questions concerning protective equipment are regarded as a reflexion on threat- and risk assessment.
Availability of tools for threat- and risk-assessment: One important is the availability of proper tools for quantification of threats as a base for risk assessment. Such tools can be a database on hazardous chemicals or software which is tailored for quick estimation of the spread of hazardous releases.
Duration of first responder training: The implication for the CAST-Curriculum was that the duration of 9 months seems out of proportion with respect to curricula for basic training. Therefore an adopted modular system had been established, with modules of approximately one month duration, which was regarded as acceptable.
Training on threats of terrorism: Questions concerning intensity and contents of training on threats of terrorism have been asked to get information on the depth of CBRNE-training, which should also reflect the awareness-level of first responders concerning threats of modern terrorism.
Training on disaster management: Questions concerning contents of training on disaster management have been asked for documentation of current capabilities of situation awareness and performance on disaster management. They were dealing with the inclusion of several scenarios or threats in training, (e.g. release of radioactive material from a nuclear facility, release of toxic material from a Seveso-II-company site, breakdown of energy supply, bomb blast disruption of communication systems).
Advanced training methods with computer-based technology and simulation: Generally speaking, with respect to availability of computational simulations, the degree of implementation generally is not very high. Biofeedback applications have not been mentioned at all. The relatively high value for use of computer simulation for law-enforcement organisations is explained by weapon training simulation.

As a summary, reflecting deficiencies in training programmes and the identified threats, a risk-matrix for the different groups of first responders has been built up.
1.3.2 WP 2 (PLUS)

WP 2 had to to provide the first responders with the tools to apply a threat-based optimum protection for themselves.

* Analysis of the information contained in the database WP No.1 (DTIC) leading to methods for enhancing the level of awareness, performance, planning and management of first responders, and
* The combination of the DTIC with WP 8 will permit the development of threat scenarios for virtual reality training. In combination with the results of the biofeedback-programme there will be enhancement of awareness and performance levels led to the two Deliverables:

D2.1: Methods for enhancing the level of awareness, performance, planning and management of first responders

A First Responder who at the scene of a major disaster is unable to fulfil his duties, stunned about the whole scenery, hundreds of dead people laying all over the place, wounded and possibly contaminated victims fleeing from the scene, catastrophic damages to property, is no assistance to the community - he may be a risk for himself and for the other FR community.

As demonstrated recently, even small groups of individuals have the ability to cause massive damage and extensive human suffering with little or no warning. Predictably, firefighters, police officers, EMS personnel, and civilian volunteers will respond and be on the scene moments after any attack occurs. For such events in the future, however, rescue and treatment of victims and control or containment of fire and other hazards will be greatly complicated by the fact that the site may also be contaminated with nuclear, chemical, biological or radiological substances that pose an immediate threat to the health and safety of the emergency responders.

A fundamental knowledge about possible scenarios and disasters lays the basis for personal awareness, the chances of facing these challenges via Risk Rating, depending on statistics of the past or newly developed semantic Ranking, gives the opportunity to prepare for possible challenges.

A proper Command and Control structure, the understanding of the capabilities and even more important the limitations of the different FR will help the Incident Commander to manage the scene. Good communications especially at larger distances will support the coordination and the performance of conducting the different tasks and so lead to an effective and timely solution of the problem.

The knowledge of the involved agencies and how to interact with them will support the planning and management circle. Risk assessment, hazard and evacuation zones and possible ways to employ the different FR will be supported by using software tools for both training and in real situation. Virtual reality training is at the time being the ultimate possibility to put the FR in a nearly real situation where he has to fulfil his job even more it is a tool that can prevent post traumatic stress disorder.

The report is structured into following main chapters:
# Threats and Training Needs of the FR community
# Ranking of existing and new Terror Threats
# Methods of enhancing the Awareness Level
# Methods of enhancing the Performance Level
# Methods of enhancing the Planning and Management
# Innovative Tools to reach the above three goals

Ranking of existing and new terror Threats is based on three different possibilities:
* Static risk rating assessment Dynamic, resulting from the event relative occurrence
* Dynamic risk rating assessment of threats cycling in real time.
Here are displayed new life cycle approaches and mathematical dependences for new exact risk rating and operational algorithm of process characteristics.
* New Terror Threats Scenario RANKING.
A ranking of possible future scenarios of new threats of catastrophic terrorism can be evaluated by semantic assessment of terrorist events and catastrophes.
Methods of enhancing the Awareness, Performance and Planning & Management level is based on the good practices of the FR community.

Innovative Tools: Modern computational technology is providing valuable tools which have to be regarded as essential support for first responders on the awareness-level and also on the performance-level. Such tools will play an important role during incident management but are also very attractive for training.

Availability of handheld powerful electronic calculating devices with the ability to implement valuable geographic information during planning and response has lead to the development of useful applications to provide and share essential on-line information or detailed instructions. Powerful graphic applications are allowing now for advanced Virtual reality systems.

This chapter is dealing with some promising examples of such emerging technologies with high potential for improvement of responders’ awareness- and performance-level.

D 2.2: Development of Virtual Reality Threat Scenarios for Training Purposes for first Responders

The application of virtual reality technology has proven to be an effective and inexpensive method of training in many different areas. As such, it is of great benefit to the first responder community dealing with the challenges of response to complex disasters, large-scale incidents, and major terrorist attacks, including those involving weapons of mass destruction (WMD). Indeed, it is much safer and less expensive to train the response to a WMD event in a virtual reality environment, rather than in a live environment.

With this in mind, the CAST Project foresees as one of its deliverables the development of a virtual reality simulation system to be used for the training of first responders. In order to demonstrate its practical application this system has been conceived as a driving simulator for the first arriving rescue unit. The pilot version of the simulator is currently under development within Work Package 8 of the CAST project as Deliverable 8.1 under the leadership of SAAB. The main purpose of the driving simulator is to train the initial response to a Call for Service by the first arriving unit, as it approaches the scene of a major incident in an emergency vehicle, gathering information and communicating with the dispatch center en route. Police has been selected as the target emergency service to be trained with the pilot version of the driving simulator.

The selected target group of first responders to be trained with the pilot version of the driving simulator is police services. The main reason for this selection is that police officers will benefit most from such training, since they have more tasks to perform during the drive to the site of the incident as compared to emergency medical services (EMS) or fire brigades, e.g., information gathering, reporting and communication, assessment of the situation and risks involved, etc. They are trained to ask a lot of relevant questions with regard to the circumstances of the incident (location, perceived area involved, type of incident, special hazards, types of resources needed, ingress and egress routes, etc.), in the first couple of minutes after the call for service, whereas firefighters or paramedics are interested only in a few specific issues related to their operations. Besides, police is usually the first emergency service to arrive on scene, and acts normally as a coordinator for all the other rescue services, relaying all the relevant information about the incident to fire and EMS. Furthermore, emergencies potentially caused by terrorist acts (e.g., explosions of unknown nature) could entail initial operational response specific to police services only, ranging from search for secondary devices to engagement with attackers (e.g., Mumbai-style terror attack). Therefore, training on the foreseen driving simulator will be most beneficial to police services.

Scenarios for the driving simulator replicate potential situations first responders may face in the future. They are complex in their nature and provide the trainees with an unusual and challenging set of circumstances, requiring them to think out of the box and expect potential escalation of the situation (e.g., secondary explosions, WMD attack, etc.).

The scenarios in this report have been developed using the information contained in the Database on Emergency Response to Major Incidents (DERMI) implemented within Work Package 1 of the CAST Project, as Deliverable 1.1. Analysis of the actual incidents that happened in the past allows to
incorporate into the scenarios lessons learned with regard to terrorist tactics, impact of the attacks, and challenges faced by the first responders.

The scenarios described below were conceived in such a way that they can also be used as a basis for further training of first responders, beyond the arrival of the first emergency vehicle to the incident site. In other words, they are well suited for training the actual initial response by different emergency services - individually or collectively - in a virtual environment, as a table-top exercise or a field exercise.

Scenario A below has been selected as the primary candidate for the pilot version of the virtual reality driving simulator under the development in WP8. As such, it includes a detailed timeline, a decision-making diagram, and criteria for terminating the exercise in case a trainee fails to perform vital tasks.

Scenario A: Two near-simultaneous car-bomb explosions with radioactive release
Scenario A involves two near-simultaneous car-bomb explosions in a city centre, one of them involving a radioactive dispersal device (RDD).

Basic assumptions

On a cold Wednesday morning in December, two near-simultaneous explosions rocked the downtown area of a large Western city within 3 minutes of each other. A group of terrorists deployed improvised explosive devices in two vans (VBIED). The first one was parked in the underground garage of a large department store - filled with hundreds of customers and personnel - in a busy shopping street. The second one - disguised as a delivery vehicle - was parked on the same street in the pedestrian area, 100 m away from the first explosion site. The IED the second vehicle contained was packed with radioactive material.

The first explosion occurred at 10:15 hours, when the streets outside started crowding with Christmas shoppers and tourists. The VBIED detonated on the first level of underground garage under the department store. The explosion sheared off the facade and almost completely destroyed the first two floors of the 4-story building. Windows were blown in over a radius of at least 200 m from the explosion site. The damage extended onto side streets hundreds of meters away. Some fifty buildings were badly damaged and 20 more sustained moderate damage. The blast killed 70 people and injured an estimated 300, many of them heavily. Inside the store, a fire started on the ground floor as water gushed from the broken pipes on the damaged upper floors.

At 10:20 h, just as the first emergency vehicle was arriving to the incident site, the second VBIED with a similar payload and a certain amount of easily dispersible radioactive material, detonated in the street, 80 m away from the approaching police car. The explosion virtually destroyed the 2-story building of a store, where the van was parked, and shattered the remaining windows in surrounding buildings. A three-meter-deep crater was left in the street. Several cars were damaged and set on fire by the explosion. About 25 people were killed and some 100 injured in this secondary attack. Many injuries on the street were caused by flying shards of glass, masonry, and fragments of cars. The radioactive material has been dispersed by the explosion over an area of approximately 200 square meters. The van continued to burn, dispersing some of the remaining radioactive substance with the smoke. The first arriving police car was also damaged by the blast wave. To add to the confusion, the blast had severed fibre optic communication cables buried beneath the street. As a result of the static caused by the bomb, mobile phones became inoperable and those that did work were soon unable to make calls due to the density of calls being made.

Scenario B: IED explosion in a subway station with simultaneous sarin release
Scenario B involves an IED explosion in a subway station of a major Western city with simultaneous release of sarin.

Basic assumptions

On a hot summer Tuesday, in the middle of a rush hour at 17:16 hours, an IED detonated in a busy metro station via remote control, killing and injuring dozens of people. At the time of the explosion, the passengers were boarding and disembarking the trains on both sides of the platform, filling the whole station. As the panic-stricken commuters started to flee from the station, an aerosol canister connected to a two-liter container filled with sarin (diluted form) and an electronic timer started to release the agent near the elevator, exposing hundreds of individuals. Several dozen civilians stayed behind to provide first aid to the injured until the arrival of emergency medical services. In the meantime, they were unwittingly exposing themselves to the nerve agent and within minutes began coughing, vomiting, convulsing, and losing consciousness. Suspecting something was wrong, some of them started to flee the station as well, using various exits to the streets aboveground.

The dispatch center received the first call reporting an explosion inside a metro station at 17:17 h and
immediately forwarded the available information to the nearest patrol car. The car arrived at the
station within 3 minutes, at 17:20 h. Just before the car arrived on scene, the officer received another
call from the dispatch center telling him that some people evacuating from the station reported
difficulties breathing. The officer reports arrival. He is about to get out of the car, when he sees two
women next to the metro exit coughing heavily. Another man is coming up from the underground
elevator vomiting and convulsing. He looks at the opposite side of the street, where another exit is
located, and sees a group of people sitting and lying on the ground, some of them covered in blood,
others coughing, vomiting and convulsing.

Scenario C: Propane explosion in a harbor with fire and domino effects
Scenario C involves an explosion of unidentified nature at a major industrial site in a mid-size
Western city with subsequent fire and domino effects.

Basic assumptions
On an autumn Tuesday morning, at 8:25h, one of the many storage tanks in a harbor with anchoring
ships is destroyed by an explosion of unknown nature. The content of the storage tank is liquefied
propane, which forms a cloud and explodes. The harbor is very busy at this morning hour, with ships
being loaded and unloaded. A total of 77 people were killed immediately. Hundreds were injured,
many of them severely, with 3rd degree burns and wounds from glass fragments and debris.

The dispatch center from the harbor security service received the first call reporting an explosion
inside the harbor at 8:26 h and immediately forwarded the available information to both a patrol on
land and a patrol boat on sea. The car arrived within about 5 minutes, the boat within 10 minutes and
started to investigate what had happened and to provide first aid to the injured.

Two minutes after the boat arrived, they detected that fragments from the original explosion hit a fuel
container and initiated a spillover of fuel and poolfire close to a LPG container with content 2 000t.
Because of the possibility of a possible BLEVE both patrols withdraw all their personnel
immediately to a distance of 6.000m which is their standard evacuation distance for this size of a
LPG container.

When rushing out of the hazard zone the crew from the patrol boat detects a hole of the size of
estimated nearly 1m² generated by an impact of a fragment into a LPG tanker with a load of 8.000t.
Reported that to the dispatch center they get the order to evacuate to a distance of 3.000 m out of the
wind direction which is West/East and to further observe the tanker.

1.3.3 WP 3 (PLUS)

Note: Several components of the results of WP 3 are considered security-sensitive and are therefore
classified. The following section contains unclassified information only.

For the first time outside the military domain the phenomenon of Catastrophic Terrorism (CT) has
been addressed in a systematic manner in the CAST project (Work Package 3). Terrorism is not a
stationary phenomenon, but has an ever-changing face. CT represents the most threatening face of
the future terrorism. The scale of an act of CT exceeds the consequences of traditional terrorism by
orders of magnitude. The most probable CT attack involves the deployment of a Weapon of Mass
 Destruction (WMD) by terrorist on a high value civilian target in a densely populated urban
environment. In addition, CT modes of attack can also include Weapons of Mass Killing and
Weapons of Mass Disturbance. CT can be characterized as the attempt to kill the maximum number
of persons and inflict material damage and/or environmental contamination as large as possible in
order to weaken the targeted population. The work carried out in WP 3 focused on the magnitude of
the impact of a CT attack by providing an overview of the initial effects of such an attack. For
example, it detailed the initial and short-term consequences for the FR community following a
nuclear WMD attack on the infrastructure of a city (blast wave, thermal wave, initial neutron and
gamma-radiation, local and regional-/global radioactive fallout and electromagnetic pulse). Also, it
provides a risk assessment for a CT attack in the EU. The results indicate that the risk for a CT attack
due to the deployment of a crude nuclear device or infectious and contagious biological agent is to be
considered as high. The risk is relatively lower (medium) for using a chemical agent in such an
attack.

The analysis identifies the operational needs for FR in case of a CT attack in order to enable them to
respond effectively on sudden notice within minutes, facing a disastrous situation of a magnitude
never experienced before, such as: large number of buildings damaged at a level of complete
physical devastation; number of dead and injured victims ranging in the tens of thousands; having to fight wide spread large fires with a seriously damaged infrastructure; the need for providing emergency medical care for mass casualties in a highly contaminated environment; necessitating the distribution of large amounts of protective gear or medications; establishing extended areas of limited access or strict quarantine.

Since a CT attack results in environmental conditions which go beyond the routine, the analysis addresses the topic areas requiring special consideration for equipment design, materials, and maintenance. Standard equipment for FR was not designed for a CT attack scenario. Therefore, WP 3 identifies the specific requirements for the FR in case of a CT attack, taking into account views of FR on personal protection needs as experienced in major terror events, technical and natural catastrophes.

Part of a potential CT attack is the use of a Weapon of Mass Disturbance (WMDi), such as a Radiological Dispersal Device (RDD). The motivation for a terrorist to use a WMDi is threefold: (1) It demonstrates to the public that almost any part of daily life can be struck by terrorists; (2) It is a low cost weapon; (3) For some of the modes of attack using a WMDi, operational requirements are relatively low. There are multiple weapons and explosives suitable for terrorist deploying WMDi. Altogether nine major categories of WMDi and thirty-four modes of their deployment have been identified. Technical and logistical details about these weapons are classified for security reasons. The relative ease with which WMDi can be built and deployed poses a significant hazard for EU citizens and FR alike. Terrorists using a WMDi have the capability to cause massive disarray in the administration and interrupt daily routines of society at a catastrophic level. This includes major damages to the critical infrastructure.

Terrorists also have the possibility to deploy a Weapon of Mass Killing (WMK). Hitherto a WMK has been used by terrorists only sporadically, e.g., during the terror attacks with fully fuelled aircraft used as guided missiles against buildings in the US on September 11, 2001. Such an attack can cause an extremely large-scale disaster, not only with hundreds of killed people, but furthermore at least the same amount of wounded. Thereby, this results in overfilled hospitals, inadequate medical treatment, and long-term psychological traumas. WMK can be divided into the following categories: (1) Weapons, with the ability to cause major physical damage, (2) Detonation of large amounts of conventional explosives, (3) Intentional release of hazardous material into the environment, (4) Improvised Explosive Devices (IED), and (5) Multipliers to reach the inherent objective of WMK - killing several hundred people. Some of the WMK are unfortunately relatively easy to design, low cost to build and easy to set up for an attack. Possible targets can be more or less any crowded place - starting from transportation systems, up to big events, like concerts or Olympic Games. The analysis in WP 3 provided an overview on such WMK-attacks in the past and thereby enables an insight what an FR has to be prepared for and what could happen in the future. In particular, WMK attack scenarios can target specifically FR in a secondary attack upon arriving on scene. WP 3 analyzed in detail the following WMK and their essential components: Aerial Bombs, missiles, MANPADS, conventional warheads, fuel air explosives, thermobaric warheads, low- and high explosives, military explosives, civil explosives (gelatineous explosives, ammonium nitrate fuel-oil (ANFO), emulsion explosives and water gels, plastified explosives). Subsequently, an analysis was carried out on practical examples, describing terror attacks and the explosives used in the past (Panam flight 103, World Trade Centre 1993, Oklahoma Building 1995, USS Cole 2000, Bali Bombing 2002, Madrid 2004, London 2005). An important aspect of the work in WP 3 was dedicated to the importance of detecting WMK prior to the detonation. All current methods were analyzed with regard to their strengths and weaknesses. It was concluded that among the imaging methods available and best developed is still x-ray imaging. A promising imaging technology is millimetre-wave and Terahertz-spectroscopy, as these technologies are penetrating materials but not ionising, i.e., they are also usable for screening of persons. A problem is low resolution of the image. An advantage is the ability to extract also specific chemical information from the signal. Commercialisation within the next few years should be possible for Terahertz and millimetre radiation instruments. Chemical analysis by vapour trace methods can be provided in different ways, from hand held sniffing devices up to drive-through portals. There is an inherent problem in so far that sensitivity depends on volatility of the substance. There is a difference of 12 orders of magnitude between vapour pressure of TATP, a common homemade explosive, and octogen, a standard military explosive. Therefore, detectability of
explosives will always be very much depending on the type of explosive and how it is packed. The most developed methods are ion mobility spectrometry and thermal energy analyzers. Currently, work is ongoing in the picogram sensitivity range, which is sufficient for the strategy to collect vapour around the object under investigation by some sucking device and collecting the particles contained in the air as a preconcentration-step for analysis. Thermal energy analyzers are limited to nitro-compounds. Ion mobility spectrometers have the advantage that they can be calibrated for the detection of a broader range of substances.

A major effort was made to analyze the threat to FR resulting from the deployment of Improvised Explosive Devices (IED) by terrorists. The following IED were analyzed: Vehicle borne IED (VBIED), mounted in any type of vehicle, including bicycles, cars, trucks, aeroplanes, boats, unmanned aerial vehicles (UAVs) and submersibles.; Projected IED, frequently used against locations that are sufficiently well protected to make their targeting by other means difficult; Person borne IED (PBIED), worn by a person, such as a vest, belt, backpack, etc. in which the person houses the whole IED or principle IED components and/or serves as the delivery or concealment means for the explosives and initiation devices.

A large effort was made on R&D related to Toxic Industrial Materials (TIM) and their intentional use by terrorists. TIM may be used, or stored for use, for industrial, commercial, medical, military or domestic purposes. TIM may be chemical, biological or radioactive and described as Toxic Industrial Chemicals (TIC), Toxic Industrial Biologicals (TIB) or Toxic Industrial Radiologicals (TIR). They can be in gas, liquid, or solid form (including particles), though those of particular concern tend to be gases because gas spreads easily. Some common TICs include: ammonia, chlorine, and hydrogen cyanide. Exposures to TICs via IEDs primarily occur from vapors that affect the eyes, nose, throat and lungs. TIMs refers to TICs or non-chemical commercial/industrial materials that may be used as weapons; for example, radioactive materials which could be found in a dirty bomb. All aspects of potential health effects from exposure to TICs/TIMs were addressed in detail.

Possible Targets for CT attacks were identified, based on intelligence information and analysis of the CAST Database DERM1, as there are: Governmental institutions (embassy, parliament, UN City, UN organisation, ...); Transportation facilities (underground railway, train station, bus station, harbour, airport, tunnels (e.g., attack on the Eurotunnel); Any crowded place; Transportation Systems (Aeroplane, ship, train); Tourist Centers and Touristic attractions; Oil Industry (gas storage tanks, pipelines, oil refineries,...); Explosives-, Fireworks-, Fertilizer- or HAZMAT producing industry; Ammunition Depots; Official Events (polls, political visits, G8 Summit, ); Religious events (visit of the Pope or other religious leaders); Sports events, like Olympic games or World Championships in sports, soccer games in general; Open air concerts; Social events like balls, charities; First Responders themselves arriving on-scene.

1.3.4 WP4 (Fraunhofer)

It was the objectives of WP4 to provide first responders with the basic, practically applicable knowledge on how to assess the threats from large releases of hazardous chemicals. Included should be an overview on how to assess the threats from emerging large releases of hazardous chemicals and to be prepared to react on un-expectedly initiated incidents. A basic understanding should give the basis to enable real time response using practical application knowledge. The expected output should be useful for establishing a related training module.

Accordingly, the main activities of WP4 in CAST concerned the continued preparation of "software/information" useful for training of paramedics and fire fighters to be described in detail by deliverable D4.1 and D4.2, and the establishing of example videos as material to generate for seminar presentations. The output of the deliverables of future utilisation by the first responders in training comprises separate approaches for:

* Paramedics
* Fire fighters
* Radiological threats: separately prepared input by PLUS and TECNATOM.

The work on WP 4 related to and continuing Deliverable D4.1 responds to the need to get simplified simulation models instead of more sophisticated ones which were strongly promoted, recently. They
should be easy to use by first responders arriving on the scene without the input of lots of chemical data of hazardous substances and they should be applicable to current available communication means. Therefore worst case estimations are used. It provides practical information and an overview on how to assess the threats from emerging large releases of hazardous chemicals and to be prepared to react on un-expectedly initiated incidents to first responders. A basic understanding should give the basis to enable real time response using practical application knowledge and should be included in a related training module (Module 3, WP9).

The results, the "standardized software-system" are split-up and reported into 2 deliverables: D 4.1 includes a presentation for paramedics, a safety distance estimation module with threat scenario and example videos. The sample videos are useful for organizing seminars and lessons for including model experiments on large scale explosions as well as examples from real accidents which occurred in the past. Paramedics: The Paramedics were provided with a basic presentation for seminars and operation in Deliverable 4.1, which includes an example presentation consisting of small charts, easy useable for training purposes, as well as during operation. In addition, a 1-2 hours presentation for seminars, focusing on raising awareness in case of a critical situation, especially if facing an unexplored (e.g. by other first responders) event which might develop to a catastrophic extension.

Fire fighters: Fire fighters got a more sophisticated version with quantitative values on safety distances and effects induced by large scale incidents. The related basic physics is shortly outlined in deliverable 4.2 (see below). In contrast to available software, the ”standardized software-system" will find a practicable way through simplified tables and graphics and computer modelling which is immediately application, onsite with worst case estimations, with currently using propane as a model substance. The "software-systems” are available as presentations useful for training modules and will be transferred throughout the project with updates to information and communication technology devices like PCs, iPads and iPods in a later to be directly applicable in a training module. It will enable exercises for the generation of scenarios where toxic or explosive gases are dispersed from pressurized vessels. In case of flammable and explosive gases the effects of fireballs, pressure, fragment ejection and related evacuation distances can be calculated and represented in maps, e.g. from Google earth or other origins or online transferred to Google maps by geometrical adapted overlays. There are also available additional graphics and video materials to modify later training modules for special purposes or variability only.

In detail the following effects are addressed:
* Gas dispersion modelling: Gaussian models
* Scaling of blasts from explosions
* Heat radiation from pool fires and fireballs
* Distances of ejected fragments
* Evacuation distances depending on threats

Two modelling examples were outlined in this deliverable.

The purpose of deliverable 4.2 was to provide a comprehensive overview on strategies to avoid or prevent DOMINO effects related to fires and explosions of fuels. The overview comprises a definition of the DOMINO effect and shows probable scenarios where it might be expected. The involved physic-chemical effects are described as they are needed to understand the prevention measures, those which are of preventive concern for planning of land-use and facilities, as well as procedures to run safe processes, and those measures to be taken on occurring accidents. The deliverable might be useful as input for preparing training curricula for first responders when addressing DOMINO effects.

Risk assessment with reference to chemical process industries use the term "DOMINO effect" to describe a "chain of accidents " , "a cascade of events in which the consequences of a previous accident are increased by following one(s), as well spatially as temporally, leading to a major accident” or situations when a fire/explosion/missile/toxic load generated by an event at one unit in an industrial facility causes additional and possibly even more hazardous accidents in adjacent units. The growth of an accident to a DOMINO effect develops to a threat to off-site targets. The European Community "Seveso-II" Directive (Directive 96/82/EC) [3] requires to assess "domino" accident hazards inside and outside the industrial sites that fall under the obligations of the Directive. Moreover, the national implementations e.g. Italian of the Directive (DL 334/99) also require the comprehensive quantitative risk analysis of areas where a high concentration of industrial sites is
present, in order to assess the potential hazards due to the interaction of multiple risk sources in a narrow area. Similar implementation was done in most industrial and some developing countries. At the latest since the adoption of the Seveso II directive into national law through national authorities, in Germany for instance “Zwölfte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes” (Störfall-Verordnung - 12. BImSchV) on 03 May 2000, competent authorities as well as operators whose operations are subject to this guideline must discuss the problems associated with DOMINO effects, especially of handling DOMINO effects by development of a methodology to estimate the risks induced by installations and facilities, as well as transport. The avoidance of DOMINO effects requires the basic understanding its individual events and their transfer mechanism. Such hazardous DOMINO effect situations carry a high probability to end up in huge catastrophes, the response to which goes to the very limit of capacities of disaster management and rescue teams. However, DOMINO effects have been documented since 1947, very little attention has been paid towards modelling this phenomena in detail. Such a modelling should enable to forecast domino effects, and assess their likely magnitudes and adverse impacts, while conducting risk assessment in a chemical process industry. It should be also the basis for avoidance.

Some spectacular DOMINO effects like the enormous disaster involving an LPG installation occurring in Mexico City, 19 November, 1984 in one of the northern quarters of the City and resulting in the deaths of over 500 people, the refinery at Vishakhapatnam, India, on September 14, 1997, the Buncefield oil storage and transfer depot, Hemel Hempstead, Hertfordshire on 11 December 2005 are listed in the Appendix. Prior to the Buncefield incident, petroleum storage sites were generally not considered to be sites where an explosion incident on this scale could occur. Buncefield challenged this worldwide perception. A study of 261 accidents [4–6] involving domino effect has been carried out. The main features have been analyzed: origin, causes, consequences and most frequent sequences. The analysis has shown that the most frequent causes are external events (31%) and mechanical failure (30%). The storage areas (37%) and process plants (27%) are by far the most common places where domino accidents have occurred. The most common sequence in the event trees resulted to be explosion-fire (21%), followed by release-fire-explosion (15%) and fire-explosion (14%). With respect to First Responders such a modelling would be also an improved basis of preparedness, education and training. Especially, DOMINO effects would expose the scope of a really large catastrophe, which substantially surpasses the normal daily experience.

In addition, it provides a situation where the involved staffs at every management and operation level faces an unbalanced situation currently unable to predict the progressing or falling "DOMINO stones" of the accident. This is similar to one of the most hazardous initiators and transmitters of a DOMINO effect the BLEVE (boiling liquid expanding vapour explosion) which could be assumed to occur multiply in fuel storage stations or petrol refineries. Therefore it described in more detail later, because of its urgent need to be suppressed, when avoiding DOMINO effects. However, the First Responders have a good chance to reduce the DOMINO effects because the "chain of accidents" might be cut be adequate measures, which is based on an immediate competent response of both management and operational staff. The initiation of a DOMINO effect can be initiated by various primary accidents or effects, mainly related to fires, flammable and explosive gases or liquids:

* Pool Fire of a leaking fuel tank
* Jet Fire from a pressurised storage tank
* Flash/ Cloud Fire from released flammable gases
* Vapour Cloud Explosion (VCE) from released explosive gases in mixture with air
* Release of Toxic Gases/ Liquids to the environment
* Blast waves from the Vapour Cloud Explosion (VCE)
* BLEVE (boiling liquid expanding vapour explosion)
* High Pressure Rupture of the containers of fuels or chemicals
* Missiles (flying fragment) from the High Pressure Rupture of containers
* A transition of Deflagration to Detonation (DDT) on fuel/chemical vapour clouds

1.3.5 WP 5 (FRK)

By the approach to get an overview over the capabilities of first responder organisations across the EU, several problems occurred, which are reflected in the results of WP 5. It was the first approach of this kind of collecting structured information from European wide acting organisations. By that, it could be shown that several organisations with the same name have different challenges in their
For example the Red Cross associations are structural different concerning the disaster relief and EMS. The Red Cross in Austria and Germany for example have a large contingent of EMTs and provide major tasks in national EMS where as the French Red Cross has nearly no activities in this sector. This makes it hard to make a direct comparison between national organisations. The results of the questionnaires of Del. 5.3 reflect this issue in the few responses of organisations. Another major impact to the results was the addressed level of hierarchy, which led to few responses in Del. 5.1 and 5.2. As there is a huge number of active persons in the bronze level (operational level) of first responder operations, there are few people in the silver level (tactical level) and even lesser of the gold level (strategic level). The hierarchy demands that information about an organisations equipment and capabilities is just given by gold level staff. Knowing this, it is predictable to get just a couple of answers by sending out questionnaires for capabilities. What seams so logic now, is a result of WP 5, which wasn't expected but is of major impact for further studies within the first responder community. The following results are to be seen under this foreground.

In Del. 5.1. and 5.2. FRK developed an online questionnaire to gather information about organisational data of institutional basics, trainings, technical standards etc. All the answers were collected in a database to have a structured overview of the capabilities of organisations across Europe. The size of this database is unseen before. There are 98 organisations from 26 countries of the EU, including first responder organisation from EMS, law enforcement, fire fighters, military and civil protection.

In Del. 5.3. the foundation of community of experts was established by asking organisations for their favoured experts in disaster relief topics. From 151 requests, there were 53 nominees. Their contacts and field of expertise were summarized in a database of expertise.

In Del. 5.4. a communication platform for first responder should have been developed. A short study of content on first responder websites showed that there were seldom websites with a combined working strategy of editorial based and community based articles. It was mostly one or the other. Furthermore the implication of social media like Facebook or twitter was not taken into account. The project team decided to go for a concept of communication with different approaches of information distribution such as providing information from the databases of CAST, providing articles, timetables for conferences and voluntary contributions with a review by experts to ensure the quality of information.

In Del. 5.5a the aim was to give recommendations for personal protective equipment (PPE) for first responders. As this is a big and widespread approach, the results are centred on special groups of first responders and on special events like fire or radioactive threats. For each chapter is a part for recommendations. But from an overall perspective the major result is not about PPE but on awareness. The first responder in terms of first incoming helper to an unknown situation has to be able to identify potential threats and to pass this information on to the upcoming emergency services, so that they can be prepared and select their PPE for the mission. For that reason, the importance of a CAST Curriculum can be underlined.

### 1.3.6 WP6 (Fraunhofer)

The objectives of WP6 are manifold:

1. The Work package has to give an assessment on current best practice concerning
   * Tactical procedures
   * Networking and communication
   * Protection
2. Identification of the necessary technical equipment
3. Practical testing of new emerging technologies (e.g., rapid deployable barriers, non-lethal response methods, sensor technology to detect and identify fires, radiation, explosion and distributed hazardous chemicals, new techniques of explosion suppression and fire fighting, protection against blast)
4. Identification of new tactical procedures for FR (operational countermeasures)
5. To collect information for best practice in the area of EU-wide CMS interconnection for networked operations.
6. Developing recommendations on how and where to network the existing competences within EU FR community
7. Identifying new concepts, technologies and software tools for efficient and effective action
8. To provide the first responder community with a recommendation for a practically applicable
technology basis and relevant knowledge through a collaboration suite for fast and effective networked First Responders.

The related results are described in detail, in 4 deliverables. In deliverable D6.1 the current best practice is recorded and discussed:

Best Practice, to be defined in general, will always include some arbitrary approaches depending on the view of a nation or an organisation. It includes also important aspects of the strategies and tactics used by the various First Responders. The focus of this deliverable is given to Multi-Agency collaboration, in order to emphasise different aspects as for example reported in Deliverable D1.3 and others, where the individual type of responders are addressed with respect to their strategic and tactical behaviour on operation. This Multi-Agency approach is a real need for large scale events and is scarcely exercised up to now and Best Practice experience should be up-date continuously in the future. There are given the basic schemes of organisational structures which have to come into place in occurring incidents. In addition, some important guidelines and checklists are provided.

A well-designed Emergency Coordinating Room (ECR) is crucial for the appropriate management of threat situations which includes Multi-Agency collaboration. Predominantly, it should be the core of the Multi-Agency use and should be designed for providing an effective and efficient collaboration among first responders. People need to get real time information quickly in order to make better decisions faster. This has to be with information access and sharing, connectivity and speed. There is a growing need for preparedness for emergency response both for man-made and natural disaster events. Effective emergency response presents a number of challenges to the responsible agencies. One major challenge is the lack of opportunities to train the emergency responders and the decision makers in dealing with the emergencies. An "On the job training” approach is not appropriate given the infrequent occurrences of such events.

Important aspects for continuous improvements include warning and emergency response system in control centres which keeps surveillance and control of CBRNEs also in case of an occurred disaster and initiates emergency actions for buildings and infrastructures. It has to combine innovative multi-sensor techniques, on-line communication, structured control and coordination centres and immediate effective response and detoxification systems related to the scenario to be applicable to fire safety, as well. Nano-technologies make the approach technical and economically feasible. Driving forces are cross disciplinary SMEs from branches, sensor, measurement and communications techniques, nano-materials and security. Their activities have to be efficiently supported by analytics and characterisation of materials and components, simulation, knowledge-based processing and to be provided by research organisations. The technologies of detection, communication and reaction strategies, multi-sensor development, IC technologies and decontamination methods are in principle known from fundamental research but not yet practiced in security. They will be developed to meet conditions of various scenarios and to implement them into buildings and infrastructures to be demonstrated by two model scenarios. Sensor development includes all types of chemical analysis, spectroscopy, nano-technology based (electro-) chemical sensors, as well as multiplexed fibre-optical spectroscopy for remote detection of toxic vapour clouds or aerosols as well as fires, their location and type. Networking - wired and wireless - links the sensors to a control unit which analyses the scanned sensor signals, initiates fast response and communicates to the outer world. Continued surveillance also in the case of occurred disaster keeps emergency and counter measures under control. Communication channels are available in most cases but not used for this purpose. Nano-structured materials like photo-catalytically active nano-TiO2 or fast burning or extinguishing nano-metal/oxide particles should destroy the hazardous substances or nano-structured super-absorbing granules take them up. The careful selection of innovative methods for detection of hazardous materials and their application is pre-requisite of response and the effectiveness of established structures. It leads to a new quality of security/safety also in private sites like sports arenas, production facilities, warehouses, ships, hotels, bureau buildings, large infrastructures and apartment houses.

The most convenient approach describes and assesses new tactical approaches to emergency response based on a risk assessment. This risk assessment was partially done in other deliverables and is shortly summarized here. A detailed catalogue of tactical and strategic procedures for each important type of incident was described in deliverable 6.4. Recent intensive research and development occurred to initiate new technologies and methods to counter terroristic activities on different levels hierarchies. However, at the current status some of these innovative approaches have been implemented others improved. These new are listed in catalogue of new tactical procedures for first responders, based on standardized threat- and risk analysis methodology and the information contained in the database. It is the intention to provide an overview to be used in education and
training programs for the First Responders. The deliverables emphasize the multi-agency approach including the pre-planning and sustained training on sites to be prepared for effective combined operations. A Multi-Agency approach dominates the situations to be improved:
* Comprehensive information: Database DERMI
* Preplanning and risk assessment in industrial facilities as basis of effective response and training of large scale disasters
* Multi-Agency Collaboration, general approaches to new tactical procedures, command structure USA and Europe (mainly UK)
* Control rooms design, structure, future development and management risks
* Modern communication technologies an urgent need to install
* Innovative support in operations by detection, mobile labs, robots and UAVs and protective equipment
* New Recommendation on large scale accidents, lessons learned from some disasters in 21st century

The main topics addressed in WP6 are selected because of shortcomings criticized in assessment of large scale incidents and the derived recommendations and conclusions. These include the knowledge of past disasters, the multi-agency-collaboration needed in these events, optimal design and use control centers, the communication at all levels of command and operation, the early request of task forces to competently identify and localize the risks and use of current technologies which are available in other industrial and technical fields. It is striking that the lessons learned are everywhere emerging well, but the reactions on these are delayed and incomplete. However, it becomes clear the addressed topics of this deliverable D6.4 are most important: Information creating awareness, pre-planning, training, multi-agency collaboration, incident command structures and communication, application of modern technology at all stages as pre-requisite. On operation FRs are subjected to various stresses and workloads, whereas they have to use heavy protection clothes and personnel protection equipment, and respiratory protection. Various type of equipment are being on development, to make his work safer, more effective and more comfortable. His body functions might be under continuous remote control, to enable a maximum exposure to these impacts, without risks of overburdening and subsequent health problems.

1.3.7 WP 7 (DSTS)

Deliverable 7.1 and 7.2

Biofeedback training has positive effects on First Responders' ability to act. Their cognitive ability to perform certainly remains intact, since relaxation and concrete action counteract traumatic handling of situations.

Biofeedback belly breathing training in preparation for deployment under the stress of catastrophic terrorism would furthermore result in significantly lower psychological stress in the First Responders. The psychological stress on the First Responders would be much more profound without belly breathing training in preparation for a deployment. This result can be achieved already after only six training sessions.

First Responders who describe themselves as technically well trained may be considered significantly more resistant to stress and they exhibit much less physical reaction to stress than those who consider themselves badly trained.

Mentally well trained First Responders exhibit significantly better stress management strategies during both test times than badly trained First Responders.

Good stress copers (test and control groups) benefit from Biofeedback training. Due to the fact, however, that a few in the control group had already experienced successful foreign deployment as emergency paramedics or under the UN (and participation was restricted here to persons with excellent mental and physical condition), there were some in the control group too who had good heart rate acceleration and therefore good physical coping strategies.

When comparing the test times 1 and 2, i.e. entry and Exit test, significant changes were identified in the personality factors empathy and openness, with the manifestation of both diminished. This means that both empathy and openness were found diminished after the Exit test, in both the test group and the control group. For the rest, no significant changes could be identified between the two test times in respect of the two groups and the personality factors.

These changes may be explained by the fact that intensified versions of two scenarios were prescribed in the Exit test. This intensification elicited heated emotional reaction in the test subjects immediately after the test (some test subjects expressed annoyance, anger and emotional shock after
viewing these scenarios), which might explain the changes in response to the Big Five Plus One. The score for the coping strategies below decreased between the entry and Exit tests in both the test group and the control group of all First Responders: stress triggers, stress manifestation, coping in general, stress stabilisation overall, stress stabilisation through everyday events, stress stabilisation through existential fears, stress stabilisation through physical manifestation, stress stabilisation through emotional-cognitive manifestation, palliative coping and external and internal stress stabilisation. No significant differences could be discerned, however, in the stress strategies of instrumental coping and stress stabilisation through interaction. There is no credible explanation for this. This result should be reconfirmed in a further study.

It is important to note that the existential fear factor was significantly higher in the voluntary First Responders group. This means that the group's reaction to massive stress would manifest itself as existential fears much more often than in the group of professional First Responders. One explanation for this result might be the very tough Military and Police selection process. The selection process in both these professional groups is tuned for the selection of stress resistant personalities. Since the applicants are stressed to the limits of their capabilities during the aptitude tests for these First Responder groups, less resistant personalities might either be rejected or decide to drop out early.

The study was able to prove that the group of voluntary First Responders reacts to stress with existential fears significantly more frequently than the group of professional First Responders. The test leader in this respect also suspects that some in the voluntary First Responders group were mentally seriously stressed even before the start of the study and that this also contributed to this significant difference between professional and voluntary First Responders. This last result of the study should actually initiate a change of attitude in the human resources departments for the First Responder groups Rescue and Fire Brigade. Recruiting volunteers without appropriate selection and preparation for traumatic situations may be considered inhumane and unethical.

The nature of terrorism has changed significantly in recent years. Whereas terrorism originally was an instrument by which a threat was made and limited damage was deemed acceptable in order to deliver a message, this has now changed to the extent that limited damage is caused in order to make world opinion aware of this message. Terrorism has now developed into catastrophe terrorism with the goal of killing a great number of people and causing significant and lasting material damage. These terrorists do not wish to negotiate nor make demands but to destroy the adversarial society. The First Responders are not, or only inadequately, prepared for this new nature of the threat. After extensive analysis of the historical development of terrorism and the technical options available to terrorists today, a possible scenario may be developed which might confront future First Responders. The preparation for such an event cannot realistically start before this scenario is known. The weak points of the First Responders are training, equipment, selection of people and psychological preparation for possible deployment.

The purpose of this study was to define effective preventive measures for the minimisation of the consequences of PTSD - as found in the study of Dr. Eva Schrank. The four occupational groups who provide First Responders have different training, different personnel selection, different structures (professional vs. voluntary organisation) and different tasks during deployment. They are all confronted with exactly the same impressions at the scene of a crime and must handle this in the same way. In the study of Obst. S. Albl, MSc., which is associated with this study, the significance of the best possible preparation, in terms of PTSD prevention as a component of training, is highlighted. A possible scenario in which all four of the occupational groups are exposed to the same conditions needed to be defined as a prerequisite for the development of a test using Biofeedback as a stress-preventing measure. Such a direct comparison between the four relevant occupational groups has not been performed so far in any study.

The sometimes significant differences between the answers of the four relevant occupational groups could be analysed based on the direct comparison of stress in identical situations and the effectiveness of Biofeedback training could be proven.

The integration of virtual reality scenarios in a technical system comprising a Dome-System in combination with a Wireless Biofeedback System will be realised in cooperation with scientists of the Vienna Technical University VRVIS, ISCC and DSTS. It is expected that this development will be demonstrated to representatives of the EU Commission before at end of June, as a prototype. It is planned to implement virtual Biofeedback training in the entire European region, for trauma prevention in all First Responder groups.
Deliverable 7.3
During the last two years of the projects time we developed a complete working prototype of virtual reality training system using a Dome linked with wireless biofeedback (Harness Biolife) consisting of software and hardware with the USP. All together it is a combination of the optical, acoustic and olfactory senses with wireless biofeedback and the virtual threat scenario of a terrorists attack. The later was produced by VRVs Mr. Dr. Fuhrmann. The odor cinema is an invention of our chemist Dr. Schneider. Our product is not a computer game, but a computer generated scenario of the reality. As an example, for the demonstration of a car bomb, we really blew up a car with explosives and made a documentation of the car wreck. These pictures were generated in our model. The help the trainee to get the feeling of a total immersion.

1.3.8 WP 8 (SAAB)

Work package 8 has delivered four deliverables:

* D 8.1 - Driving situation simulator
* D 8.2 - Instructor supervision desk software
* D 8.3 - Report of assessment of FR groups on VRST and training in a simulated emergency control room
* D 8.4 - Recommendations for closing gaps or tailoring technology based security programs

1.3.8.1 Driving situation simulator

The driving situation simulator is a tool enabling multiple users to drive towards a scene of a larger accident by using advanced 3D graphics in virtual environments. The training is supervised by an administrator who can monitor the exercise from a top view. The administrator can also change the behaviour of the simulation to provide a more dynamic training scenario for the trainees. All actions taken during the training is recorded and can be replayed and analysed. To provide the first responders WP 8 has implemented a scenario provided in delivery 2.2 within the driving simulator. This scenario was demonstrated during the CAST final meeting.

1.3.8.2 Instructor supervision desk software

The instructor supervision desk software is a web based application designed and implemented for use in crisis management training. The software allows for a training organisation to plan and setup an exercise for a target organisation in need of training. While the training is being executed the system collects the input from several observers or persons playing actor roles in the exercise. The system administrators can control the speed of the exercise to reduce or increase the task load of the persons being trained. When the training event is finished the system provides detailed reports of all events collected during the exercise.

1.3.8.3 Report of assessment of FR groups on VRST and training in a simulated emergency control room

This deliverable has been divided into two sub deliverables as two separate reports.

The first report describes the tests that have been done on personnel in a simulated emergency control room and includes definition of stress, effects of stress, bio feedback tests, stress management and a study on stress prevention training.

The second report describes training requirements for a emergency operations center (EOC) simulator and simulation considerations for multiple EOC's.

1.3.8.4 Recommendations for closing gaps or tailoring technology based security programs

The last deliverable of the 8th work package is a report that targets several problems and gaps but also gives recommendations on how to address these issues. To mention a few of the topics in the report it includes recommendation on how to realize training among first responders, communication and networks, current situation of control rooms and guidelines for new rooms, strategies and tactical procedures initiation of response, technical and engineering gaps.
WP 9 had to deliver the deliverable 9.1: "standardized, modular curriculum of training of first responder."

This standardized security training curriculum contains training material and practical exercises, based on the following five methodical approaches, integrating theoretical methodology with gaining practical experience in the field:

1. Modern, didactically refined lectures and seminars, emphasising interactive learning and including self-tutoring possibilities during off-campus periods based on very comprehensive experience.
2. This comprehensive experience will be documented in a readily available and detailed, open-structured, user-friendly data-base, based on state-of-the-art software-tools in data management and knowledge management.
3. Computer-based interactive models and virtual reality with biofeedback, simulating threat scenarios and the resulting consequences without and with appropriate countermeasures.
4. Realistic field exercises on consequence management, using a variety of simulated threat scenarios, such as managing the aftermath of coordinated bio- and radiological terror attacks, mass killings, and simultaneous cyber attacks on the FR communication- and situation awareness system.
5. Evaluation of 3 D-computer-models during the practical field exercises.

With respect to this, the CAST curriculum relies on the following principles:

* Target group of the CAST curriculum are representatives of the medium management level of first responder organisation, typically young officers.
* CAST curriculum will be conducted as an integrative course for members of any type of first responder organisation of any EU member state!
* It is not the goal to educate fire-fighters or policemen!
* CAST has to provide the interdisciplinary knowledge and skills for management of the aftermath of an incident of catastrophic terrorism, regardless of national peculiarities and regardless of the individual standards of expertise.

Thus, the main challenges are not the specialized contents of the different modules but the choice and development of the proper methods of education, reflecting the broad range of educational levels among the potential participants!

An important feature of training modules regarding the CAST-philosophy will be flexibility:

* We should be aware, that participants might be confident, that the education they had to pass within their organisation is among the best in the world!
* We don't have to invent or provide "better basic training" for any first responder unit!
* We have to give them the feeling, that they are well trained and eventually also experienced responders!
* We have to stimulate a process of mutual exchange of experience during CAST training sessions.
* Participants have to learn from each other.
* Only if the participants have the feeling, that their education and experience is well recognized, the specialised contents of the CAST curriculum can be transmitted successfully.

Therefore the CAST-curriculum provides a space, which encourages participants to present their knowledge, experience and capabilities and to share them with other participants.

We are planning the methods of lecture, seminars and workshops. Workshops are considered to provide the proper stage for such valuable exchange of expertise and experience. They will make use of the DERMI-database, which deals with response to major disastrous incidents and was developed in WP1 (D.1.1)

Another main feature of the CAST-curriculum is the integration of computer-based training tools such as the virtual reality biofeedback system (D7.3) and the driving simulator (D8.1). A simulated control room of a nuclear power plant (TEC-DSTS-ISCC D 8.3) is regarded as a field exercise as well as decontamination procedures or training on detection of hazardous material or EOD-procedures, conducted in the field. Also these scenarios can be linked with a biofeedback system.
The Evaluation of 3 D-computer-models for threat- and risk evaluation during the practical field exercises will be achieved by implementation of software-tools which have been evaluated in Del 3.2.

To implement the CAST curriculum as an academic course, it was designed following Austrian Regulations, reflecting the implementation of the Bologna-process. The description of work claims the development of a 9month training course with 25 hours of training a week. This roughly corresponds to 900 hours of training. According to the guidelines, an academic course should consist of 40% lectures, 10% guided self-instruction, 50% unguided self-instruction. This means, that CAST has to cover the 40%+10% part! Together with the 50% unguided self-instruction the CAST training course represents 1800 hours, which corresponds to 60 ECTS-points, which is one academic year.

A master degree has to comprehend academic courses representing 120 ECTS-points. A thesis counts for 40 ECTS-points. So, if one participant has attended special courses counting for 20 ECTS-points (e.g. EOD-training,...), the complete package, * CAST training course (60 ECTS-points)
* thesis (40 ECTS-points) and
* additional special courses (20 ECTS-points)
will represent 120 ECTS-points, which means the fulfilment of the requirements for a master-degree. Therefore, the modules have to cover approximately 130 hours of training, including 20 hours proseminars, which reflects the 10% of guided self-instruction.

Hundred of training course on the management of catastrophes are provided to the First Responder (FR) community in the 27 Member States of the European Union (EU). Member States train and equip their FR to manage a wide range of catastrophes and the responsibility for adequate FR response to catastrophes rests with the competent authorities of individual Member States. However, the consequences of some catastrophes, e.g., after a chemical, biological, radiological or nuclear (CBRN) terror attack, a large accident in a nuclear facility (INES scale 7) with significant uncontrolled off-site release of radioactivity, or an earthquake (RICHTER scale 8) hitting a densely populated urban area, are likely to exceed current national FR capabilities of some Member States. In WP 9 we analysed a representative number of these courses and tried to close the gaps. The CAST curriculum is intended to support the authorities in their task of responding and mitigating the consequences of such catastrophes to lives, property and the environment EU Member States are likely to face in the future.

The CAST curriculum is based on the analysis of Best Practices for training FR developed in the EU, Russian Federation (RUS), and the United States of America (USA), focusing on practically applicable and effective methods in protecting themselves and saving lives after a catastrophic terror attack, a large scale industrial accident, or a large natural catastrophe. Furthermore, the content of the CAST curriculum uses the results of a comprehensive analysis of Lessons Learned in man-made and natural catastrophes which have occurred worldwide.

### Potential impact and main dissemination activities and exploitation results

1.4.1 Potential Impact by WP1 results

In the future, the DERMI database is intended to be used in CAST training courses for EU first responders. It can be used as a base for comparative assessment of strengths and weaknesses within one’s own organisation. Furthermore, it is also a source for scenario-development for training-purposes and for information for the EU-project BRIDGE, where PLUS is a member of the consortium.

Analysis of current training programmes and the threat-scenarios to be dealt with clearly shows the main deficiencies on tactical and technical communication, establishment if adequate risk- and threat assessment, awareness to avoid self-endangering. So these topics have to be regarded as the key-issues for advanced training of first responders to be prepared to face threats of catastrophic terrorisms. This will be addressed by the CAST-curriculum. Facing threats of catastrophic terrorism, there has to be a change in responding philosophy which contradicts usual behaviour of responders: sometimes a turn-back decision will be the better strategy with respect to efficiency in providing help. This will be the case with the scenario of a crude nuclear
bomb and with incidents in the industrial environment with the threat of domino effects or BLEVE. First responders have to be aware that they might be a target as well in the second stage of a terrorist attack.

1.4.2 Potential Impact by WP2 results

Awareness, performance, planning and management, transparent Command and Control structures and proper training is the key to cope with a major disaster. A fundamental knowledge about possible scenarios and disasters lays the basis for personal awareness, the chances of facing these challenges via Risk Rating, depending on statistics of the past or newly developed semantic Ranking, gives the opportunity to prepare for possible challenges. A proper Command and Control structure, the understanding of the capabilities and even more important the limitations of the different FR will help the Incident Commander to manage the scene. The knowledge of the involved agencies and how to interact with them will support the planning and management circle. Risk assessment, hazard and evacuation zones and possible ways to employ the different FR will be supported by using software tools for both training and in real situation. Especially virtual reality training is at the time being the ultimate possibility to put the FR in a nearly real situation where he has to fulfil his job even more it is a tool that can prevent post traumatic stress disorder.

1.4.3 Potential Impact by WP3 results

The work of WP 3 shows clearly that managing the risk associated with CT should be considered a top priority security problem, and in each EU member state viewed as of major concern for the national FR community. Society in the EU member states has become considerably more vulnerable to CT attacks due to its high degree of sophistication and interdependence. In addition, European FR require additional training on CT. Such training needs to assess the magnitude of the impact of a CT attack, as well as practically applicable information on risk assessment for a CT attack in the EU involving WMD, WMK and WMDi.

Furthermore, such training should provide an overview of the operational needs for FR by describing the situation FR will have to respond to in case of a CT attack in a realistic manner, facing a disastrous situation of a magnitude never experienced before. Since a CT attack results in environmental conditions which go beyond the routine, the training module should also address the topic areas requiring special consideration for equipment design, materials, and maintenance.

1.4.4 Potential impact of WP4 results

Risk assessment with reference to chemical process industries use the term "DOMINO effect" to describe a "chain of accidents", "a cascade of events in which the consequences of a previous accident are increased by following one(s), as well spatially as temporally, leading to a major accident" or situations when a fire/explosion/missile/toxic load generated by an event at one unit in an industrial facility causes additional and possibly even more hazardous accidents in adjacent units. The growth of an accident to a DOMINO effect develops to a threat to off-site targets. The overall criteria for evaluating and avoiding the DOMINO effects should in future be based upon the detailed knowledge of all physical and chemical phenomena related to it. These include the substances possibly involved, the possibilities to for accidents, the sources of start for initiating primary sources, the mechanisms to transfer the accident from source one to multiple secondary sources and to off-site targets. This knowledge should be used for any other activities to analyse scenarios and situation, to plan facilities as well as to prepare methods to protect or fight on running accidents. Accordingly, strategies for avoidance of the DOMINO effect should combine: Physico-chemical phenomena and modelling and its up-data according to the state of the art of theory and experimental possibilities:
* Deterministic experimental investigations of basic physics and chemistry of individual mechanisms and their transfer potential to neighboured hazardous device and quantitative real accident analysis
* Physical approaches to model all related effects and combine single effects to a transfer chain
* Design and safety management
* Design of facilities in storage, transport and handling of dangerous goods of chemical industries
based on the experimental theoretical approaches to understand the damage mechanisms with a focus on
* Safe distances of device to contribute to the DOMINO effect
* The effects are largely estimated by comparison to past data
* Probabilistic analysis of scenarios especially including failure probabilities from real data, which means a failure analysis of the individual components
* Awareness of risks and preparedness to respond on progressing BLEVE, DOMINO effect
However, the past showed that despite of measures to avoid accidents they occurred and first responders had to come into action. Therefore, in both events of a BLEVE or a DOMINO effect the first responders are on the scene and their competent activities could also avoid a DOMINO effect or stop the DOMINO effect or the prevent effects of off-site damage as addressed in the deliverables.
* Direct response strategies of First Responders
* Innovative measurement on accidents to correctly analyse and evaluate the situation
* Future R&D to keep the applied technological level strategies and measures at the state of the art of fire, explosion science
The effects and phenomena are so manifold and the literature extensive, that it is only possible to describe the most important aspects of the DOMINO effect. Sophisticated theoretical models which mainly concern thermal mechanisms are only mentioned and the reader is referred to the cited literature in the deliverables.

Practically, for both types of first responders - fire fighters and paramedics - the results of Wp4 will enrich illustrations of later training modules especially addresses large scale incidents and the need for adequate training for these situations. More detailed and continuously updated versions of presentation and lessons in seminars and training modules to be based on the outline in the related deliverables throughout after the project and have to be checked for applicability by the trainers and teachers:
* Some basic principles on hazards of dispersed substances, fires and explosion from the deliverables and
* Get, in addition, an impression from catastrophic events involving dispersion of flammable /flammable gas, dusts or liquids # selected videos # get more information in the internet:
The fire fighters got more sophisticated information on:
* Effects: dispersion, deflagration, explosions, deflagration-detonation transfer, BLEVE with Domino effects, jet fires, dust explosions
* Transfer standardized effects to absolute distances and k-Values
* Pressure effects, blast, thermal and radiation, fragment impact
The output included the transfer of standardized safety distances to zones (K-values) in maps (software):
* gas dispersion
* flames, fireballs
* pressure
* fragments
* evacuation distances
as overlays in Google Earth in simplified worst case configurations and demonstrated by an example with assumed hazardous materials.

1.4.5 Potential impact by WP 5 results

From Del. 5.1 to 5.4, the results are pointing straight to a development of an overall first responder website including information about different first responder groups and their exchange. This is a direct social impact to the community itself. If the masterpiece of building such a huge platform, which is also accepted by the community, is done for real, it would be a dramatic shift in the social network of first responder groups. Now, there are solutions and communication networks for fire fighters or for police or for EMS. But one platform for all, with a list of trusted experts would be the first step to a structured, social interoperability of first responder. Speaking in terms of dissemination of the results from WP 5, the spreading of the databases would be already a major benefit for the first responder community. For the FRK the databases are a direct improvement of the organisational knowledge, which can be distributed to the Red Cross community. The databases are also a good foundation for an exchange of experts, as there are already some projects founded by the EU. Another exploitation of the databases and the concept for a communication platform is the approach
for another FP7 Project, which is already under development to deliver the realisation of the communication platform.

For the impact of the results of Del. 5.5a, about PPE, the fact of the need for trainings is the most important message. Which equipment is the best can change within some months. But the fundamental problem of awareness stays. The exploitation within the Red Cross will be a request of improvement to the training facilities of the Red Cross and an implementation of an awareness-lesson in first aid instructions in Austria. If this proves to be a well accepted enhancement of trainings, it will be recommended to other national branches of the Red Cross, so that the resilience of society could be improved across Europe.

1.4.6 Potential Impact by WP6 results

First Responders will be exposed to very new threats by deployment of Weapons of Mass Killing (WMK) and see extreme operational challenges on a WMK attack because of the large scales of the incident, being: large extent of damaged area, large number of victims, Domino Effects (collateral negative developments and subsequent incidents with catastrophic results), inadequate risk assessment, impeded uses of vehicles, in-appropriate personal protection equipment, multi-agent dispersion in the environment, lack of hard information, psychological threats due to extremely mutilated victims, and inadequate means to achieve fast recovery. However, there occurred many accidents at industrial sites and natural catastrophes which deploy a similar or even more severe character than the use of WMKs by terrorists. Therefore both events are considered as analogues which require extreme efforts for their response. The main approach to cope with such situations is a collective effort of all forces available which requires an extensive collaboration of the Agencies of First Responders representing all types. The focus emphasises this Multi-Agency collaboration and addresses the related structures to efficiently implement these. Best Practices should not only be a term of general meaning to include activities worldwide, but is in reality governed by the specific insight of responsible persons from a country and/or an organisation. The Current Best Practice needs to induce a mechanism of continuous up-date of strategies, tactics, equipment and support of individual humans. Tactics are currently developing into new approaches and into the fighting against the un-known and difficult to train large scale incidents. Interoperability and the required adequate communication technologies play an important role which is actually addressed in most countries but the realisation is far from being complete. The continuous up-date of Best Practice, development of improved strategic and tactical procedures and equipment should be based on a thorough analysis of incidents, because exercise and training can never perfectly replicate the reality. In addition, large incidents and disasters occur rather scarcely and proceed always in a different way. The main topics are described in this deliverable are selected because of shortcomings criticized in assessment of large scale incidents and the derived recommendations and conclusions. These toxics are the knowledge of past disasters, the multi-collaboration needed in these events, optimal design and use control centers, the communication at all levels of command and operation, the early request of task forces to competently identify and localize the risks and use of current technologies which are available in other industrial and technical fields. It is striking that the lessons learned are everywhere emerging well, but the reactions on these are delayed and incomplete. However, it becomes clear the addressed topics of this deliverable D6.4 are most important: Information creating awareness, pre-planning, training, multi-agency collaboration, incident command structures and communication, application of modern technology at all stages as pre-requisite. The extracts from the disaster assessment are quite similar. "Bridging the Gap" should be in future an approach to identify and respond to gaps in strategies, tactics, equipment and human support. These gaps are still found in the multi-agency-collaboration needed in large scale events, optimal design and use of control centers, the communication at all levels of command and operation, including the early request of task forces to competently identify and localize the risks and the use of current technologies which are available in other industrial and technical fields. This "Bridging the Gap" initiative already led to intensive R&D activities which are described but should be still enhanced and established as a "programme" in the future.

1.4.7 Potential Impact by WP7 results

A main result of the Work Package 7 is the development of a computer-based training tool (virtual reality) linked with a wireless biofeedback system. This development is a worldwide unique product, which will be used for CAST-training courses. It is the development of the hard- and software of a virtual reality biofeedback training tool with optical, acoustical and olfactory stimulation of a threat
scenario related to a disaster caused by terrorists.
This system can be established as a very useful tool in trainings for various aspects:
* Biofeedback training as a monitoring tool for the assessment of training programmes and for the preparedness of first responders
* Biofeedback training as a mean for enhancement of situational awareness by supporting stress-management
* Virtual reality as a mean for post traumatic treatment of first responders
* Virtual reality Biofeedback training could furthermore help in the assessment of the right person for special force groups.
It can be anticipated, that this should be a basic training of a first responder to prevent them from post traumatically stress disorders and to introduce the individual into its work within a task force group.

1.4.8 Potential Impact by WP8 results:
Training and simulation technology have been increasingly important throughout the society. The defence forces have used the term gaming for over 100 years. Technology based training started to emerge and mature late 1980 and early 1990 along with the increased use of computer and video technology.
The control and protection of the modern societies and its functional flows is complex and it will be even more complex as we build in more and more dependencies. One situation that seems to be isolated might very quickly show to have a cascading effect since other functions are dependent on its full function. This leads to an increased need to share information and train where we have to act and decide on shared information. The ability to classify and decide what tactics to apply needs to be trained in all aspects. It has to be trained in unexpected as well as complex scenarios. The commanders need to be able to sort and decide what information to act on faster than before and with much higher risks than before.
There are several routes/paths when deciding what tools that best meet the need and the market "flooded" with solutions and technology. The First Responder user is an expert on applying methods in order to overcome and successfully execute a mission. Those methods and use of the tools are, and will most likely continue to be, the best alternative to train in a very realistic way. The tactics and how to manage a mission in total is well suited for simulation or gaming technology.
In this work package we have tested several technologies that could be used to model and execute scenarios as described above and with credible realism. We have seen that the scenario planning for complex information scenarios need to tighten which is one of the deliveries in this work package, i.e. exercise control and exercise management.
The choice made for the 3d scenario is based on 3 prerequisites:
* strong community of present users
* ease to model complex and event driven scenarios
* ability to generate credible reality in the visualisation.
The system/technology parts, provided in the work package, covers the fundamental parts, as described above, needed in order to reach the capability to generate and manage complex scenarios.

1.4.9 Potential Impact by WP9 results
The CAST-curriculum provides a space, which encourages participants to present their knowledge, experience and capabilities and to share them with other participants.
We are planning the methods of lecture, seminars and workshops.
Workshops are considered to provide the proper stage for such valuable exchange of expertise and experience. They will make use of the DERMI-database.
A main feature of the CAST-curriculum is the integration of computer-based training tools (virtual reality) linked with a wireless biofeedback system (D7.3). One of the unique products, which will be used for CAST-training courses, is the development of the hard- and software of a virtually biofeedback training tool with optical, acoustical and olfactoric stimulation.
This system can be established as a very useful tool in training for various aspects:
* Biofeedback training as a monitoring tool for the assessment of training programmes and for the preparedness of responders
* Biofeedback training as a mean for enhancement of situational awareness by supporting stress-management
* Virtual reality as a mean for post traumatic treatment of first responders

It can be anticipated, that the basic training of a first responder, at least for fire-fighters or policemen, could be regarded equivalent with a bachelor-degree. So, it might be of special interest, to add the CAST-training course to achieve a master-degree. Therefore, the CAST-training course can be offered as a master-degree course. The conductance of a master degree program might be a key for the establishment of a standardized education programme for first responders since this would provide a wider platform for building up a network of medium management level of the FR-community.

**Address of project public website and relevant contact details**

http://www.castproject.eu
### 4.2 Use and dissemination of foreground

**Section A (public)**

**Publications (peer reviewed)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Main author</th>
<th>Title of the periodical or the series</th>
<th>Number, date or frequency</th>
<th>Publisher</th>
<th>Place of publication</th>
<th>Date of publication</th>
<th>Relevant pages</th>
<th>Permanent identifiers (if applicable)</th>
<th>Is open access provided to this publication?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Terrorziel Europa</td>
<td>Steinhäusler Friedrich</td>
<td>Monography</td>
<td>1st Edition Edition a</td>
<td>Wien</td>
<td>01/01/2011</td>
<td>189</td>
<td>Chrome</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**List of Dissemination Activities**

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of activities</th>
<th>Main Leader</th>
<th>Title</th>
<th>Date</th>
<th>Place</th>
<th>Type of audience</th>
<th>Size of audience</th>
<th>Countries addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conference</td>
<td>UNIVERSITAET SALZBURG</td>
<td>The 5th European Computing Conference (ECC ’11)</td>
<td>28/04/2011</td>
<td>Paris, France</td>
<td>Scientific community (higher education, Research)</td>
<td>500</td>
<td>Europe</td>
</tr>
<tr>
<td>2</td>
<td>Flyers</td>
<td>Bundesministerium fuer Landesverteidigung</td>
<td>CAST: Modernstes Katastrophenmanagement</td>
<td>01/01/2011</td>
<td>Vienna, Austria</td>
<td>Scientific community (higher education, Research)</td>
<td>1000</td>
<td>Austria</td>
</tr>
<tr>
<td>3</td>
<td>Publication</td>
<td>TECNATOM S.A.</td>
<td>Nuclear Security and Training Countering Hostile</td>
<td>01/09/2011</td>
<td>Spain</td>
<td>Scientific community (higher education, Research)</td>
<td>500</td>
<td>EU</td>
</tr>
<tr>
<td>No.</td>
<td>Title</td>
<td>Description</td>
<td>Date</td>
<td>Location</td>
<td>Audience Type</td>
<td>Country/Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
<td>-------------</td>
<td>---------------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Workshop</td>
<td>RAUNHOFER-GESELLSCHAFTBLEVE Schulfungsmodule</td>
<td>02/01/2011</td>
<td>Furtwangen, Germany</td>
<td>Research</td>
<td>EU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence First Responders Preparedness and Risk Rating of EU Terror Threats Life Cycles</td>
<td>11/01/2010</td>
<td>Tel Aviv, Israel</td>
<td>Scientific community (higher education, Research)</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence Conceptual Design of European Integrated Scenario-Simulator for Cross-border Disaster Management</td>
<td>11/01/2010</td>
<td>Tel Aviv, Israel</td>
<td>Scientific community (higher education, Research) - Policy makers</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence New Terror Threats CAST L: Computer-Aided System for Terrorist Librettos</td>
<td>03/02/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence The Solution of International Project CAST of 7th FP EC Security Research - European First Responder</td>
<td>03/02/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence CAST Project exhibition exposition with video-clips projection</td>
<td>10/05/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>TV clips</td>
<td>Czech Republic-Ministry of Defence-University of Defence The Blast – Simulation of pressure wave for WP 3 - Blast simulation 2D/3D</td>
<td>16/05/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Type</td>
<td>Organization</td>
<td>Description</td>
<td>Date</td>
<td>Location</td>
<td>Sector</td>
<td>Participants</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
<td>------------------------</td>
<td>---------------------------------</td>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>TV clips</td>
<td>Czech Republic-Ministry of Defence</td>
<td>Schemes for WP 3 – 3D tunnel model + 3D Autodesk Inventor Viewer</td>
<td>10/05/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>1600 International</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>TV clips</td>
<td>Czech Republic-Ministry of Defence</td>
<td>Attack on underground station, Simulation of 5 kg TNT charge explosion, Cut-and-Cover station, Terro</td>
<td>10/05/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>1600 International</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Workshops</td>
<td>SAAB Training Systems</td>
<td>Crisis Training Exercise</td>
<td>01/06/2010</td>
<td>Elverum, Norway</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>0 Norway</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Presentations</td>
<td>SAAB Training Systems</td>
<td>Demonstration of AKKA Portable</td>
<td>01/05/2011</td>
<td>Vienna, Austria</td>
<td>Civil society</td>
<td>0 Austria</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Presentations</td>
<td>SAAB Training Systems</td>
<td>Usage of AKKA Portable in civil military relations exercise VIKING 11</td>
<td>01/05/2011</td>
<td>Enköping, Karlskrona, Sweden</td>
<td>Civil society - Policy makers</td>
<td>0 Sweden</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Presentations</td>
<td>FORSCHUNGSINSTITUT DES ROTEN KREUZES</td>
<td>Usage of AKKA Portable in crisis training by the Red Cross</td>
<td>01/06/2011</td>
<td>Austria</td>
<td>Civil society</td>
<td>0 Austria</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Articles published</td>
<td>FORSCHUNGSINSTITUT DES ROTEN KREUZES</td>
<td>CAST: Handlungsfähige Einsatzkräfte auch im Katastrophenfall</td>
<td>01/09/2009</td>
<td>Vienna, Austria</td>
<td>Civil society</td>
<td>1500 Austria</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Press releases</td>
<td>FORSCHUNGSINSTITUT DES ROTEN KREUZES</td>
<td>CAST: Handlungsfähige Einsatzkräfte auch im Katastrophenfall</td>
<td>18/08/2009</td>
<td>Vienna, Austria</td>
<td>Medias</td>
<td>10 Austria</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Web sites/Applications</td>
<td>FORSCHUNGSINSTITUT DES ROTEN KREUZES</td>
<td>CAST</td>
<td>01/08/2009</td>
<td>Vienna, Austria</td>
<td>Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias</td>
<td>0 Austria, International</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Publication</td>
<td>FORSCHUNGSINSTITUT DES ROTEN KREUZES</td>
<td>Tätigkeitsbericht 2010</td>
<td>31/12/2010</td>
<td>Vienna, Austria</td>
<td>Civil society</td>
<td>300</td>
<td>Austria, International</td>
</tr>
<tr>
<td>21</td>
<td>Exhibitions</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Interschutz</td>
<td>07/06/2010</td>
<td>Leipzig, Germany</td>
<td>Scientific community (higher education, Research) - Industry - Civil society</td>
<td>0</td>
<td>International</td>
</tr>
<tr>
<td>22</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Anti-Terror-Gipfel in Salzburg</td>
<td>21/02/2011</td>
<td>Salzburg, Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>23</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Modernstes Katastrophenmanagement</td>
<td>04/06/2011</td>
<td>Salzburg, Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>24</td>
<td>Media briefings</td>
<td>DSTS ADVISERS TO EXECUTIVES, MAG.SCHRANK &amp; PARTNER KG</td>
<td>Handlungsfähige Einsatzkräfte auch im Katastrophenfall</td>
<td>17/06/2011</td>
<td>Baden, Austria</td>
<td>Scientific community (higher education, Research) - Medias</td>
<td>25</td>
<td>Austria</td>
</tr>
<tr>
<td>25</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Katastrophenfilm für alle Sinne</td>
<td>24/06/2011</td>
<td>Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>26</td>
<td>Presentations</td>
<td>DSTS ADVISERS TO EXECUTIVES, MAG.SCHRANK &amp; PARTNER KG</td>
<td>Virtual Reality Simulation</td>
<td>30/06/2011</td>
<td>Baden, Austria</td>
<td>Scientific community (higher education, Research) - Civil society</td>
<td>100</td>
<td>Europe</td>
</tr>
<tr>
<td>27</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Vorbereitung für</td>
<td>06/07/2011</td>
<td>Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>28</td>
<td>Publication</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Security perception in the EU - today and tomorrow</td>
<td>11/01/2010</td>
<td>Tel Aviv, Israel</td>
<td>Scientific community (higher education, Research)</td>
<td>300</td>
<td>International</td>
</tr>
<tr>
<td>29</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Härtestest in der Kuppel des Grauens</td>
<td>17/07/2011</td>
<td>Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>30</td>
<td>Articles published in the popular press</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Ein Experte gegen Terror</td>
<td>04/08/2011</td>
<td>Austria</td>
<td>Civil society</td>
<td>0</td>
<td>Austria</td>
</tr>
<tr>
<td>31</td>
<td>Interviews</td>
<td>UNIVERSITAET SALZBURG</td>
<td>Zehn Jahre 9/11 - Wie vernetzt sind Angst und Terror</td>
<td>06/09/2011</td>
<td>Salzburg, Hangar 7</td>
<td>Scientific community (higher education, Research) - Civil society - Policy makers - Medias</td>
<td>300</td>
<td>Europe</td>
</tr>
<tr>
<td>No.</td>
<td>Type</td>
<td>Country/Institution</td>
<td>Title</td>
<td>Date</td>
<td>City, Country</td>
<td>Community</td>
<td>Sector</td>
<td>Country</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-----------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>32</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence</td>
<td>Risk Rating on Common Threats Life Cycles</td>
<td>30/09/2009</td>
<td>Zin, Czech Republic</td>
<td>Scientific community (higher education, Research)</td>
<td>500</td>
<td>International</td>
</tr>
<tr>
<td>33</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence</td>
<td>Risk Rating of Global Terrorist Threats Life Cycles - new historic/process approach to a security</td>
<td>30/12/2009</td>
<td>Praha, Czech Republic</td>
<td>Scientific community (higher education, Research) - Industry - Policy makers</td>
<td>500</td>
<td>International</td>
</tr>
<tr>
<td>34</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence</td>
<td>First Responders: Operation Capabilities Standardisation within EU</td>
<td>02/06/2010</td>
<td>Zilina, Slovak Republic</td>
<td>Scientific community (higher education, Research) - Industry - Policy makers</td>
<td>500</td>
<td>International</td>
</tr>
<tr>
<td>35</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence</td>
<td>Operational Capabilities Standardization of First Responders within EU</td>
<td>02/06/2010</td>
<td>Zilina, Slovak Republic</td>
<td>Scientific community (higher education, Research) - Industry - Policy makers</td>
<td>500</td>
<td>International</td>
</tr>
<tr>
<td>38</td>
<td>Publication</td>
<td>Czech Republic-Ministry of Defence-University of Defence</td>
<td>A step forward in the education of first responders in crisis situations at EU level.</td>
<td>19/05/2011</td>
<td>Brno, Czech Republic</td>
<td>Scientific community (higher education, Research)</td>
<td>300</td>
<td>International</td>
</tr>
<tr>
<td>39</td>
<td>Presentations</td>
<td>DSTS ADVISERS TO EXECUTIVES, MAG.SCHRANK &amp; PARTNER KG</td>
<td>Presentation of CAST at the fire fighter organisation local command Baden</td>
<td>09/09/2009</td>
<td>Baden, Austria</td>
<td>Civil society</td>
<td>50</td>
<td>Europe</td>
</tr>
</tbody>
</table>
### Section B (Confidential or public: confidential information marked clearly)

#### LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, UTILITY MODELS, ETC.

<table>
<thead>
<tr>
<th>Type of IP Rights</th>
<th>Confidential</th>
<th>Foreseen embargo date dd/mm/yyyy</th>
<th>Application reference(s) (e.g. EP123456)</th>
<th>Subject or title of application</th>
<th>Applicant(s) (as on the application)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Mark</td>
<td>No</td>
<td>31/08/2011</td>
<td>000</td>
<td>CASTL# = Computer-Aided System for Terrorist Librettos</td>
<td>UDB - Urban, R. Urbáněk, J.F &amp; Urban Roman</td>
</tr>
<tr>
<td>Type of Exploitable Foreground</td>
<td>Description of Exploitable Foreground</td>
<td>Confidential</td>
<td>Foreseen embargo date dd/mm/yyyy</td>
<td>Exploitable product(s) or measure(s)</td>
<td>Sector(s) of application</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------</td>
<td>--------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Documentation tool for first responder exercises</td>
<td>AKKA by SAAB; Usability tests by FRK</td>
<td>No</td>
<td>00</td>
<td>1. Use of the software in real events; 2. Use of the software for training of first responders</td>
<td>00</td>
</tr>
</tbody>
</table>

**ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND**

<table>
<thead>
<tr>
<th>Description of Exploitable Foreground</th>
<th>Explain of the Exploitable Foreground</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKKA by SAAB; Usability tests by FRK</td>
<td>AKKA by SAAB; Usability tests by FRK</td>
</tr>
</tbody>
</table>
### 4.3 Report on societal implications

#### A. Ethics

<table>
<thead>
<tr>
<th>Q.</th>
<th>Ans.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did your project undergo an Ethics Review (and/or Screening)?</td>
<td>No</td>
</tr>
<tr>
<td>If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?</td>
<td></td>
</tr>
<tr>
<td>2. Please indicate whether your project involved any of the following issues:</td>
<td></td>
</tr>
<tr>
<td>RESEARCH ON HUMANS</td>
<td></td>
</tr>
<tr>
<td>Did the project involve children?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve patients?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve persons not able to consent?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve adult healthy volunteers?</td>
<td>Yes</td>
</tr>
<tr>
<td>Did the project involve Human genetic material?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve Human biological samples?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve Human data collection?</td>
<td>No</td>
</tr>
<tr>
<td>RESEARCH ON HUMAN EMBRYO/FOETUS</td>
<td></td>
</tr>
<tr>
<td>Did the project involve Human Embryos?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve Human Foetal Tissue / Cells?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve Human Embryonic Stem Cells (hESCs)?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project on human Embryonic Stem Cells involve cells in culture?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?</td>
<td>No</td>
</tr>
<tr>
<td>PRIVACY</td>
<td></td>
</tr>
<tr>
<td>Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?</td>
<td>No</td>
</tr>
<tr>
<td>Did the project involve tracking the location or observation of people?</td>
<td>No</td>
</tr>
<tr>
<td>RESEARCH ON ANIMALS</td>
<td></td>
</tr>
<tr>
<td>Did the project involve research on animals?</td>
<td>No</td>
</tr>
</tbody>
</table>
Were those animals transgenic small laboratory animals? No

Were those animals transgenic farm animals? No

Were those animals cloned farm animals? No

Were those animals non-human primates? No

RESEARCH INVOLVING DEVELOPING COUNTRIES

Did the project involve the use of local resources (genetic, animal, plant etc)? No

Was the project of benefit to local community (capacity building, access to healthcare, education etc)? No

DUAL USE

Research having direct military use Yes

Research having potential for terrorist abuse Yes

B. Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

<table>
<thead>
<tr>
<th>Type of Position</th>
<th>Number of Women</th>
<th>Number of Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Coordinator</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Work package leaders</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Experienced researchers (i.e. PhD holders)</td>
<td>11</td>
<td>49</td>
</tr>
<tr>
<td>PhD student</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

4. How many additional researchers (in companies and universities) were recruited specifically for this project? 2

Of which, indicate the number of men: 2
C. Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?  
   Yes

6. Which of the following actions did you carry out and how effective were they?

<table>
<thead>
<tr>
<th>Action</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and implement an equal opportunity policy</td>
<td>Very effective</td>
</tr>
<tr>
<td>Set targets to achieve a gender balance in the workforce</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Organise conferences and workshops on gender</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Actions to improve work-life balance</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?  
   Yes

If yes, please specify: Volunteers were selected in order to be equal men and women as well as fellow researchers and employees

D. Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?  
   No

If yes, please specify:

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?  
   No

E. Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

| Main discipline:          | 5.1 Psychology     |
| Associated discipline:    | 5.1 Psychology     |

F. Engaging with Civil society and policy makers

11a. Did your project engage with societal actors beyond the research community? (if Yes
<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?</td>
<td>Yes, in communicating /disseminating / using the results of the project</td>
</tr>
<tr>
<td>11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?</td>
<td>Yes</td>
</tr>
<tr>
<td>12. Did you engage with government / public bodies or policy makers (including international organisations)</td>
<td>Yes, in communicating /disseminating / using the results of the project</td>
</tr>
<tr>
<td>13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?</td>
<td>Yes - as a primary objective (please indicate areas below multiple answers possible)</td>
</tr>
<tr>
<td>13b. If Yes, in which fields?</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>No</td>
</tr>
<tr>
<td>Audiovisual and Media</td>
<td>Yes</td>
</tr>
<tr>
<td>Budget</td>
<td>No</td>
</tr>
<tr>
<td>Competition</td>
<td>Yes</td>
</tr>
<tr>
<td>Consumers</td>
<td>No</td>
</tr>
<tr>
<td>Culture</td>
<td>No</td>
</tr>
<tr>
<td>Customs</td>
<td>No</td>
</tr>
<tr>
<td>Development Economic and Monetary Affairs</td>
<td>No</td>
</tr>
<tr>
<td>Education, Training, Youth</td>
<td>Yes</td>
</tr>
<tr>
<td>Employment and Social Affairs</td>
<td>No</td>
</tr>
<tr>
<td>Energy</td>
<td>No</td>
</tr>
<tr>
<td>Enlargement</td>
<td>No</td>
</tr>
<tr>
<td>Enterprise</td>
<td>Yes</td>
</tr>
<tr>
<td>Environment</td>
<td>Yes</td>
</tr>
<tr>
<td>External Relations</td>
<td>No</td>
</tr>
<tr>
<td>External Trade</td>
<td>No</td>
</tr>
<tr>
<td>Fisheries and Maritime Affairs</td>
<td>No</td>
</tr>
<tr>
<td>Food Safety</td>
<td>No</td>
</tr>
<tr>
<td>Foreign and Security Policy</td>
<td>Yes</td>
</tr>
<tr>
<td>Fraud</td>
<td>No</td>
</tr>
<tr>
<td>Humanitarian aid</td>
<td>Yes</td>
</tr>
<tr>
<td>Human rights</td>
<td>No</td>
</tr>
<tr>
<td>Information Society</td>
<td>No</td>
</tr>
<tr>
<td>Institutional affairs</td>
<td>No</td>
</tr>
<tr>
<td>----------------------</td>
<td>----</td>
</tr>
<tr>
<td>Internal Market</td>
<td>No</td>
</tr>
<tr>
<td>Justice, freedom and security</td>
<td>Yes</td>
</tr>
<tr>
<td>Public Health</td>
<td>Yes</td>
</tr>
<tr>
<td>Regional Policy</td>
<td>Yes</td>
</tr>
<tr>
<td>Research and Innovation</td>
<td>Yes</td>
</tr>
<tr>
<td>Space</td>
<td>No</td>
</tr>
<tr>
<td>Taxation</td>
<td>No</td>
</tr>
<tr>
<td>Transport</td>
<td>No</td>
</tr>
<tr>
<td>13c. If Yes, at which level?</td>
<td>International level</td>
</tr>
</tbody>
</table>

**G. Use and dissemination**

| 14. How many Articles were published/accepted for publication in peer-reviewed journals? | 2 |
| To how many of these is open access provided? | 2 |
| How many of these are published in open access journals? | 1 |
| How many of these are published in open repositories? | 0 |
| To how many of these is open access not provided? | 0 |

Please check all applicable reasons for not providing open access:

- publisher's licensing agreement would not permit publishing in a repository: No
- no suitable repository available: No
- no suitable open access journal available: No
- no funds available to publish in an open access journal: No
- lack of time and resources: No
- lack of information on open access: No
- other: No
- If other - please specify: 

| 15. How many new patent applications ('priority filings') have been made? ('Technologically unique': multiple applications for the same invention in different jurisdictions should be counted as just one application of grant). | 0 |

| 16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box). |
Trademark
Registered design
Other

17. How many spin-off companies were created / are planned as a direct result of the project?
0

Indicate the approximate number of additional jobs in these companies:
0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:
Increase in employment, In small and medium-sized enterprises

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:

0

Difficult to estimate / not possible to quantify

H. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?
Yes

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?
No

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

Press Release
Yes

Media briefing
Yes

TV coverage / report
Yes

Radio coverage / report
Yes

Brochures / posters / flyers
Yes

DVD / Film / Multimedia
Yes

Coverage in specialist press
Yes

Coverage in general (non-specialist) press
Yes

Coverage in national press
Yes

Coverage in international press
No

Website for the general public / internet
Yes

Event targeting general public (festival, conference, exhibition, science café)
Yes
23. In which languages are the information products for the general public produced?

<table>
<thead>
<tr>
<th>Language</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Language of the coordinator</td>
<td>Yes</td>
</tr>
<tr>
<td>Other language(s)</td>
<td>Yes</td>
</tr>
<tr>
<td>English</td>
<td>Yes</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Grant Agreement number:</td>
<td>218070</td>
</tr>
<tr>
<td>Project acronym:</td>
<td>CAST</td>
</tr>
<tr>
<td>Project title:</td>
<td>COMPARATIVE ASSESSMENT OF SECURITY-CENTERED TRAINING CURRICULA FOR FIRST RESPONDERS ON DISASTER MANAGEMENT IN THE EU</td>
</tr>
<tr>
<td>Funding Scheme:</td>
<td>FP7-CP</td>
</tr>
<tr>
<td>Project starting date:</td>
<td>01/07/2009</td>
</tr>
<tr>
<td>Project end date:</td>
<td>30/06/2011</td>
</tr>
<tr>
<td>Name of the scientific representative of the project's coordinator and organisation:</td>
<td>Prof. Friedrich Steinhäusler UNIVERSITAET SALZBURG</td>
</tr>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>31/08/2011</td>
</tr>
</tbody>
</table>

This declaration was visaed electronically by Friedrich STEINHAESLER (ECAS user name nsteinfh) on 31/08/2011