



EUROPEAN  
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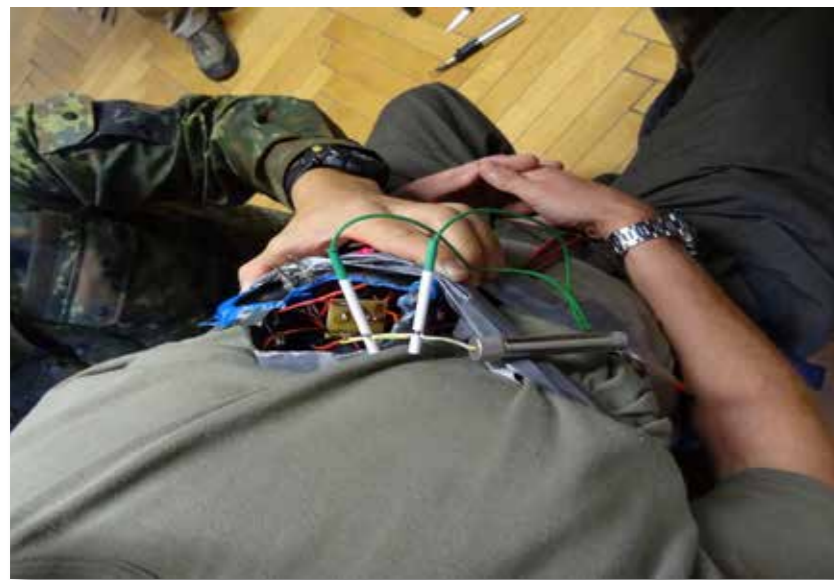
European  
Centre for  
MAnnual  
Neutralisation  
  
Capabilities



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Hostage situations generate an additional challenge to the MNT Operator - knowledge about the behavioural dynamics of a Person in Crisis, special communication and psychological strategies are mandatory to sustain control and successfully solve such an event.

... and the will to fill capability gaps. In 2004 former Capt Pirolt as commander of the EOD Training Center Großmittel realized that EOD operators with heavy bomb suits and robots could successfully dispose of a vast majority of IEDs. His technical expertise, the study of relevant literature, training courses abroad, combined with curiosity and creativity led in 2006 to the first national IEDD course. But solving complex scenarios without any collateral damage would require additional skills, techniques and expertise. In 2010, the European Defence Agency (EDA) developed these new skills for the first time at the European level. The implementation followed 2011 in Austria at national, later at a multinational level. Under the auspices of the EDA, there were annual basic MNT courses, the EUROPEAN GUARDIAN exercise series and special courses from 2014 to 2017.

The follow-on EDA project started January 2018, which is also the birth of the European Center for Manual Neutralisation Capabilities (ECMAN). This continuous development could only succeed through a close alliance of those responsible in the Austrian MOD and the EDA as well as the seven participating nations. Now its the right moment to say „Thank you“.

The Austrian Logistics School sees itself as a „mother ship“ for ECMAN. Multinational training requires a variety of support and assistance. There we see our future task: to remove obstacles in the way of ECMAN and to provide the respective framework it needs to concentrate on its tasks. I would like to express my great appreciation to LtCol Pirolt, his national staff as well as his multinational experts for his perseverance and commitment.

May ECMAN reach its level of ambition in the next few years, advance teaching and research, and always be one step ahead of the bomb-makers and terrorists.

## IMPRESSUM:

Medieninhaber, Herausgeber und Hersteller:  
Redaktion: HLogS  
Breitenseerstraße 61, 1140 Wien  
Fotos: Bundesheer  
Herstellungsort: Wien  
Druck: Wien

# PRELIMINARY REMARKS

By BG Dieter Jocham

Commander Armed Forces Logistics School

## In the beginning there was curiosity

... and the will to fill capability gaps. In 2004 former Capt Pirolt as commander of the EOD Training Center Großmittel realized that EOD operators with heavy bomb suits and robots could successfully dispose of a vast majority of IEDs. His technical expertise, the study of relevant literature, training courses abroad, combined with curiosity and creativity led in 2006 to the first national IEDD course. But solving complex scenarios without any collateral damage would require additional skills, techniques and expertise. In 2010, the European Defence Agency (EDA) developed these new skills for the first time at the European level. The implementation followed 2011 in Austria at national, later at a multinational level. Under the auspices of the EDA, there were annual basic MNT courses, the EUROPEAN GUARDIAN exercise series and special courses from 2014 to 2017.

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## ECMAN

*Developing Manual Neutralisation*

*Techniques at the highest Standards.*

## ECMAN FACTS & FIGURES

1 7 NATIONS  
AUSTRIA (LEAD), CZECH REPUBLIK,  
FINLAND, GERMANY, IRELAND,  
ITALY, SWEDEN

2 14 EXPERTS  
2 BRANCHES  
≥ 8 EVENTS PER YEAR

3 TRAINING BRANCH:  
BASIC & CBRN MNT COURSE  
REFRESHER COURSES  
ADVANCED COURSES  
EX EUROPEAN GUARDIAN

4 KNOWLEDGE BRANCH:  
TREND ANALYSIS  
TECHNOLOGY WATCH  
EQUIPMENT DEVELOPMENT  
CAPABILITY DEVELOPMENT

5 COURSES & EXERCISES  
IMPLEMENTATION CONSULTING  
CAPABILITY DEVELOPMENT  
KNOWLEDGE PLATFORM  
DEVELOPING MN EVALUATORS

6 INTERNATIONAL COOPERATION  
WORLDWIDE MN NETWORK  
SPECIAL FORCES  
MILITARY & POLICE





# DIRECTOR'S MESSAGE

Dear Ladies and Gentlemen,

I would like to introduce the European Centre for Manual Neutralisation Capabilities (ECMAN), a multinational sponsored entity, which was established based on previous efforts of the European Defence Agency and some member states since the beginning of 2010. The Centre is located in Austria and was established on 24th March 2017, when the Sponsoring Nations and EDA signed the Programme Arrangement.

The ECMAN is a follow-on activity of the EDA Category B Programme Manual Neutralisation Techniques Courses and Exercises (MNT C&E). It is based on the experiences gained by MNT C&E considering a closer involvement of the cMS and cost efficiency regarding external support. Close involvement during the entire cycle of a Manual Neutralisation (MN) activity will provide nations with highly skilled MN personnel.

IEDs are still causing significant casualties in operations, missions as well as in civil surroundings. Countering IEDs remains a priority for all pMS as listed in the EDA Capability Development Plan. There are situations in which the operational environment makes the risk of exploding a device unacceptable. In those situations, the use of regular EOD procedures and energetic weapons may be inappropriate and Manual IED Neutralisation Capabilities are the last resort.

The availability of personnel with the highest possible qualification and an extensive up-to-date knowledge on the current and expected future development of the multinational MN capability should enable nations and organisations to fully implementing this niche capability.

Furthermore, ECMAN is a perfect example for Pooling & Sharing in the European context. The requirement of having a number of highly qualified MN personnel per cMS and the increased cost of training and education highlight the need for the application of the P&S principle. Sharing of knowledge is another added benefit and the Programme is following the policy framework for systematic and long-term defence cooperation and provides a stronger, coherent and enhanced basis in the field of MN capabilities.

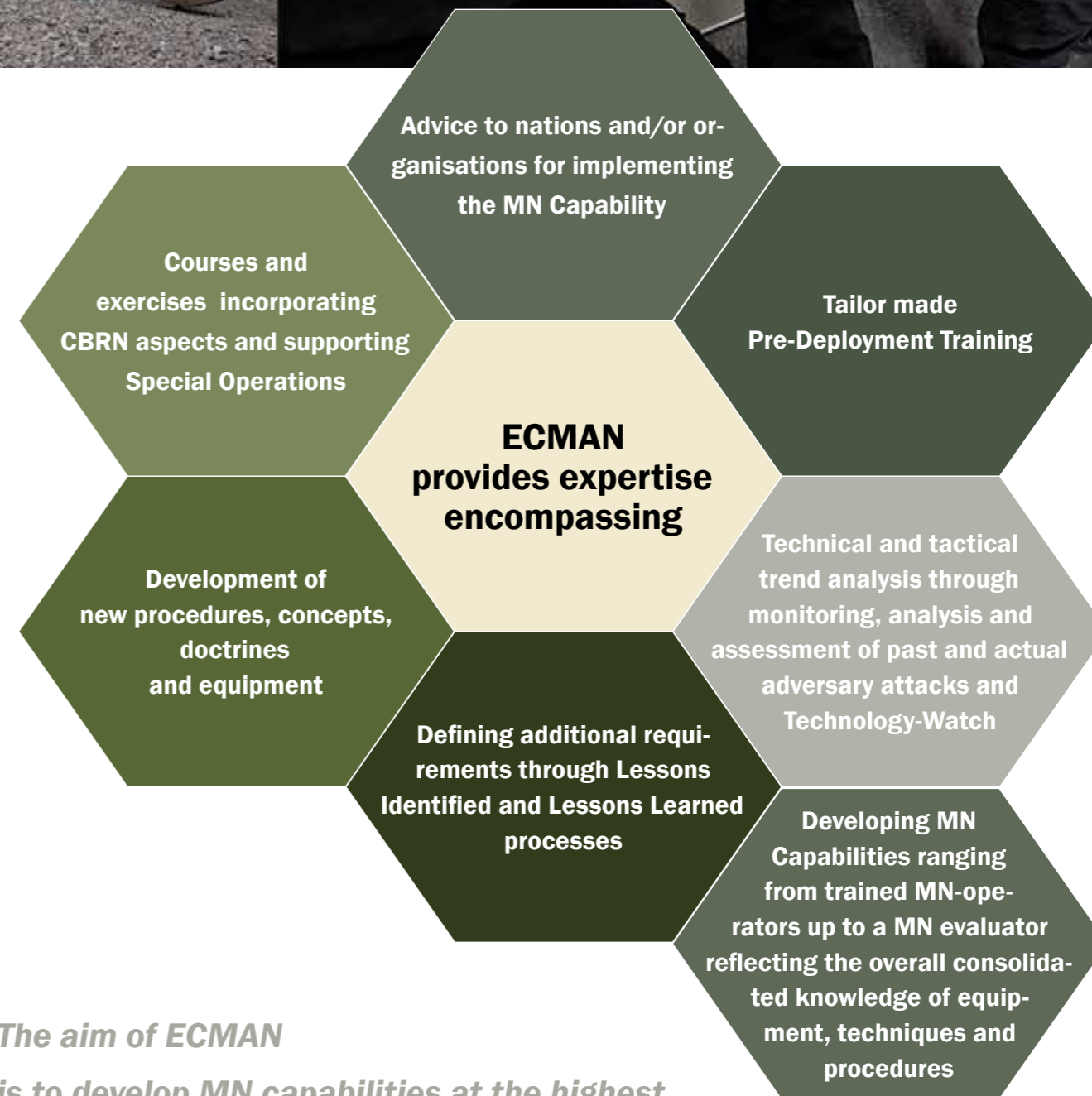
It provides opportunities to enhance education and training, to improve interoperability and capabilities, to assist in doctrine, TTPs and equipment development. ECMAN ensures also testing and validation of concepts through experimentation.

Lieutenant Colonel Juergen Pirolt

Director ECMAN



▲ Close cooperation and coordination with Special Forces and CBRN units are key



*The aim of ECMAN is to develop MN capabilities at the highest standards to contribute to an overall C-IED strategy.*



# The ECMAN Legend and Signet



The Signet and Legend was subject of a competition at the Vienna Federal Training and Research Institute of Graphic Arts ("Die Graphische"). Die Graphische is celebrating 130 years of vocational education in graphic arts and is one of the partner schools of the Logistic School.

Two Classes with 60 students participated in the competition. The students had been coached by 4 teachers: M. Dunkl, W.Gregori, B. Sassmann and G. Schwenbacher.

The winning result is a combination of the design of two teams: Christoph Heitzinger together with Fabian Müller as well as Monika Dabrowska.

# The Signet

The signet is intended to provide a protective shield compatible with the mission statement of ECMAN and the MNT Operator, the GUARDIAN. In the shield the individual letters are to be found. Perhaps not at first sight, but that as well is suitable for ECMAN, an organization covertly working for safety and security.



# The Legend

The legend consists of a lettering where the M is modelled from two cables which have been cut. This is the ultimate way of bomb disposal which is largely based on electronics. The shape of the M is also based on a shield as ECMAN stands for safety and protection.



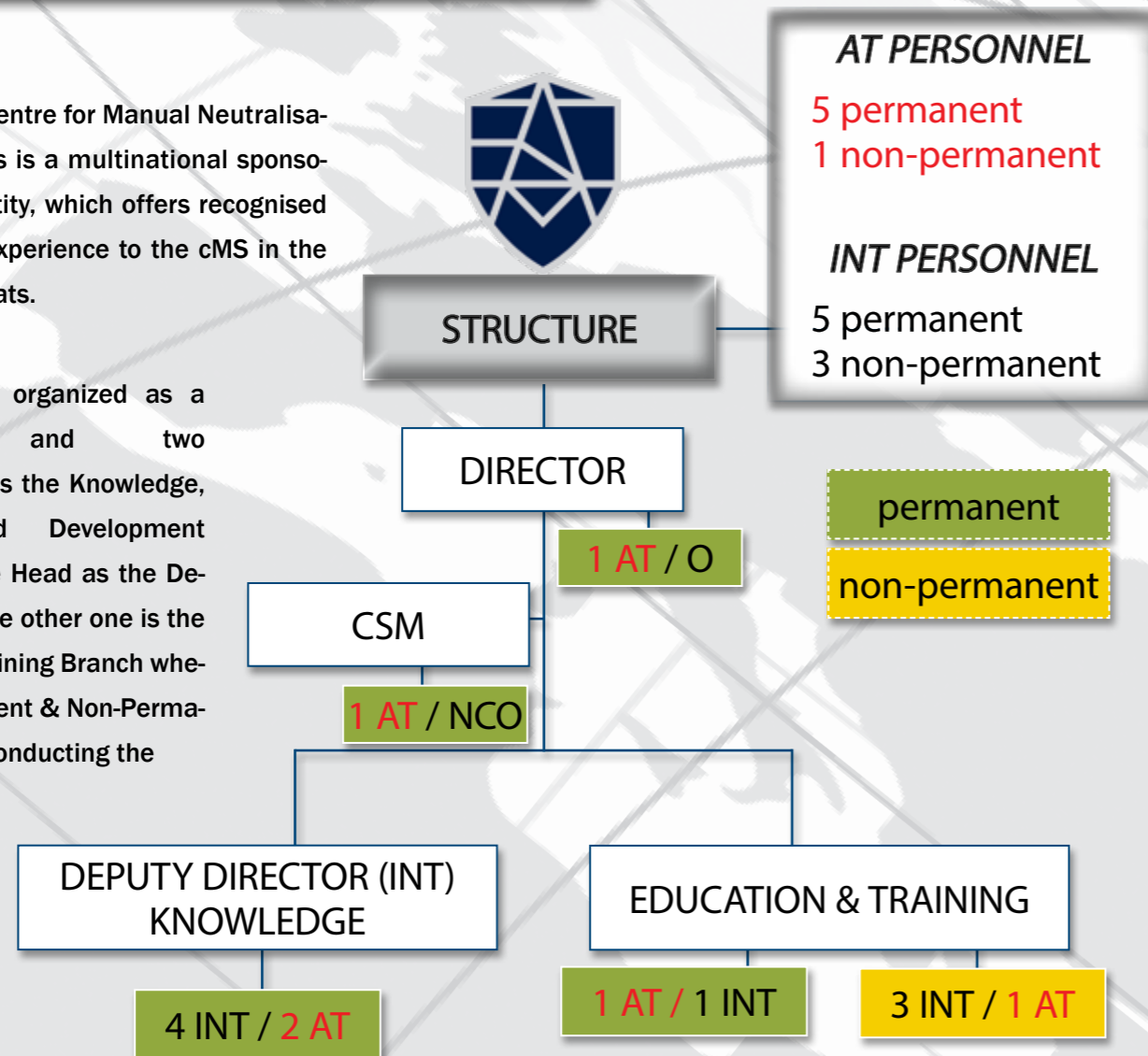
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# ORGANIZATIONAL STRUCTURE

The European Centre for Manual Neutralisation Capabilities is a multinational sponsored manned entity, which offers recognised expertise and experience to the cMS in the field of IED threats.

The ECMAN is organized as a Directorate and two Branches. One is the Knowledge, Research and Development Branch with the Head as the Deputy Director, the other one is the Education & Training Branch where both Permanent & Non-Permanent Staff are conducting the ECMAN Events.



# CONTRIBUTING MEMBER STATES



# THE REASON FOR MNT – THREATS AND SCENARIOS

Improvised Explosive Devices (IEDs) continue to be the weapon of choice for adversary networks and this phenomenon is likely to continue for decades either with the IED as the only threat or combined with others within a hybrid complex scenario. There are situations where the operational environment makes the risk of exploding a device unacceptable. In these situations the use of standard EOD disruptors may be inappropriate and manual Neutralisation Techniques may be required. Such situations may include:



- a direct threat to human life
- in combination with CBRN payload/Homemade explosives (HME) or dual precursors
- a direct threat to critical military and civil infrastructure
- a critical effect on the mission
- the recovery of an intact device is of interest for exploitation
- support to Special Operations Forces



The trend in the 21st century has shown an increasing use of sensitive Home Made Explosives and sophisticated use of sensorics and electronics and anti-handling switches. The aim of the perpetrators has transitioned from killing a single person or destroying infrastructure into achieving a maximum number of killed and wounded including the use of chemical agents, furthermore the EOD operator gets into the focus of the adversaries as a target. As the sophistication of terrorist IEDs increases in design and sensor integration, so does the inherent risk to EOD Operators attempting to perform manual render safe procedures. The tactic of utilizing electronic detection systems within IEDs requires



Explosive Ordnance Disposal (EOD) Operators to continually refine their ability to recognize and address anti-tamper constructed devices. Understanding the intrinsic hazards and vulnerabilities associated with the use of detection systems is essential for the safety and success of the EOD Operator's Mission.



# THE PSYCHOLOGICAL IMPLICATIONS OF MNT

## CAN IT GET WORSE? - YES IT CAN!

By Nicola Hermes von Luedinghausen  
Psychologist at the German EOD Center

Working in darkness because of a Light Threat or facing a Person in Crisis  
When technology meets its limits - nothing compares to human sensors!  
Core principles, effective verbal and even non-verbal communication have to be applied to maintain dominance.

### THE CHALLENGE

To defuse an explosive device there are different techniques to be used which depend on the mission. The safest way is to use a robot, energetic weapons and work from a distance.

But sometimes the devices are enhanced with radiological substances, biological or chemical payloads, occasionally there are even hostages involved. These circumstances and the local environment are unratable and complex, so highly specialised and educated operators have to be employed to assess and manage this situation and render the device safe.

These operations are very intense, both physically and mentally challenging. That is why only fully trained and psychologically qualified personnel is chosen to receive the advanced training.

### MENTAL STRENGTH

Knowing that the smallest error or shortest moment of abstraction could harm themselves and cost their and other people's lives, damage infrastructure and/or material is psychologically very pressuring.

Often operators have to stay, move and work in uncomfortable positions for hours - sometimes in the dark. The air supply may be limited and personal protective equipment may hinder them. They are fully aware that only highest concentration keep their chances alive to solve the situation.

MNT operators permanently have to refresh their personal skills and drills: without precise experience and profound knowledge they can't successfully defuse a device.

### TEAMWORK

To act efficiently operators not only have to be smart and sophisticated but also perform with high mental imagery to discover solutions out of the box.

To survive in the Kill-Zone working in a team is mandatory. The *four-eyes* principle helps them to avoid deadly mistakes. On paper there is obviously a Team Commander between them, but when it comes to the work on the ground all are equal. Any decision and „Positive Action“ is done in unanimity - this acts as their safety line in an inherently dangerous job.



▲ When the human factor kicks in, permanent interaction with the *Person in Crisis* challenges the operator to his mental limits as besides dealing with the bomb he has to keep control over the hostage



▼ For MNT operators working in darkness is daily business. Ruling out light sensitive switches is just too dangerous.



*You can lose control at first contact if you are not aware of the Do's and Don'ts*



# THE CBRN ASPECTS IN MNT

CLOSE COOPERATION WITH TRADITIONAL AND EVEN SCIENTIFIC CBRN SUPPORT IS CRUCIAL

CBRNe Terrorism is not a fiction. CBRNe capabilities of terrorist groups and “lone wolves” have improved over the last years.

## THE THREAT

CBRNe Terrorism is not a fiction. The capabilities of terrorist groups and “lone wolves” have improved over the last years. Additionally, the nuclear threat is still alive. Attacks with Chemical Weapons are still happening despite a strong Chemical Weapons Convention, as seen by the alleged use of sarin, chlorine and sulphur mustard in Syria and Iraq. Da`Esh (IS - Islamic State) and Al-Nusra have or at least had access to chemical warfare agents. IS has the knowledge how to produce sulphur mustard.

## CBRN MATERIALS

CBRN materials are used to enhance IEDs and include not only chemical or biological warfare agents, but also Toxic industrial materials (TIM). Even if the toxicity of chemical warfare agents is several orders of magnitude higher than most TIM, a careful selection of agent and the proper location such as confined spaces may have similar effects as Chemical Warfare Agents. The TIM may also be used to distract First Responders and specialists and slow them down as they have to use CBRN protective equipment.

## PARADIGM CHANGE

Scenarios of real concern are those devices with Chemical Warfare Agents, when e.g. VX, sarin or sulphur mustard is used. There has been a paradigm change over the last couple of years as there is no more any moral barrier to using chemical weapons. Taking into consideration that just one droplet of VX is absolutely deadly, one can imagine the high level of expertise, training and equipment which is required to render safe devices containing these agents, including all aspects of safety and preserving the evidence.

## CHALLENGES

When it comes to neutralize improvised CBRN devices, MNT comes into play. The reason is fairly simple: Conventional IEDD techniques just do not work as the application of these techniques would release the agent and the main focus for the neutralisation is to avoid this. Additional aspects regarding the neutralisation of a CBRN device are avoiding cross contamination as far as possible, choosing the appropriate level of individual protection and the identification of the agent as early as possible.

## WAY AHEAD

However, the focus on CBRN MNT is not only the technical aspect how to render a CBRN device safe. It's also about interoperability between the MNT team and CBRN and forensic specialists. CBRN MNT may play a major part in counter-improvised explosive devices (IED) work including CBRN related issues. Scanning the horizon regarding the CBRN IED capability of the opponent is another aspect to be covered. This includes a profound analysis of potential agents, dissemination methods and current technologies used by terrorist networks. Having this knowledge of the opponent's capabilities is crucial not only for MNT operators, but also for the supporting CBRN specialists on site. The ECMAN project is very promising to strengthen the capabilities to Counter CBRNe Threats in a very positive way.

*A CBRN Attack is regarded as a Worst Case Scenario*

*A release must be prevented by all means!*



Sampling and Identification of the threat is crucial to determine the appropriate cordon & evacuation radius, select personal protective equipment and prepare suitable mitigation measures





# THE ENEMY

## THE IED

### TERRORIST'S WEAPON OF CHOICE

Improved Explosive Device - The BOMB!  
The MNT operator has to know it all...

#### THE IED DESIGN

IEDs placed by terrorist organisations, religious extremist groups or even criminal individuals are posing a grave threat in today's warfighting or crisis areas as well as in our civilized, high developed environment. The possible range of IED designs are almost limitless, and is bounded only by the terrorist's ingenuity, technical ability and the materials available to him. However, experience has shown that almost every homemade build explosive device is based on the following main components:

#### MAINCHARGE

The main charge or payload achieves the terrorist's desired effect on the target, and is usually some kind of explosives. Explosives are divided into Low Explosives that burn and High Explosives that detonate. High Explosives is much more powerful than Low Explosives. The range starts from simple black powder or pyrotechnic mixtures via commercial explosives (ANFO, blasting gelatine) and military explosives up to high sensitive home made explosives made up of peroxides.

#### INITIATOR

The Initiator or Detonator begins the explosion process, usually on the completion of an electrical circuit. Conventional Explosives usually requires a detonator, while Home-made Explosives sometimes can be initiated using a heat source or flame. Detonators can be chemically, mechanically, or electrically initiated, the latter two being the most common. Commercially available Detonators are constructed inside a thin metal tube which makes it possible to see it on X-Ray pictures. Homemade detonators instead can use cardboard, glass or plastic tubes as housings which makes them very difficult to recognize.

#### POWER SOURCE

The Power source provides the power for the IED. Batteries are the most common type of power source. In the old times batteries were quite easy to distinguish, because of their standardized shapes, sizes and voltages. Meanwhile through the miniaturisation of electronic devices like mobile phones or RC-Toys especially Lithium batteries come in any possible size and shape.

#### FIRING SWITCH

The Firing switch completes the circuit, allowing power to flow to the initiator. It is also the component that classifies the type of IED and determines how the device will be used. There are three types of firing switches. Time devices allow a delay to initiation, so that the perpetrator can be elsewhere when the device functions. Victim Operated IEDs are

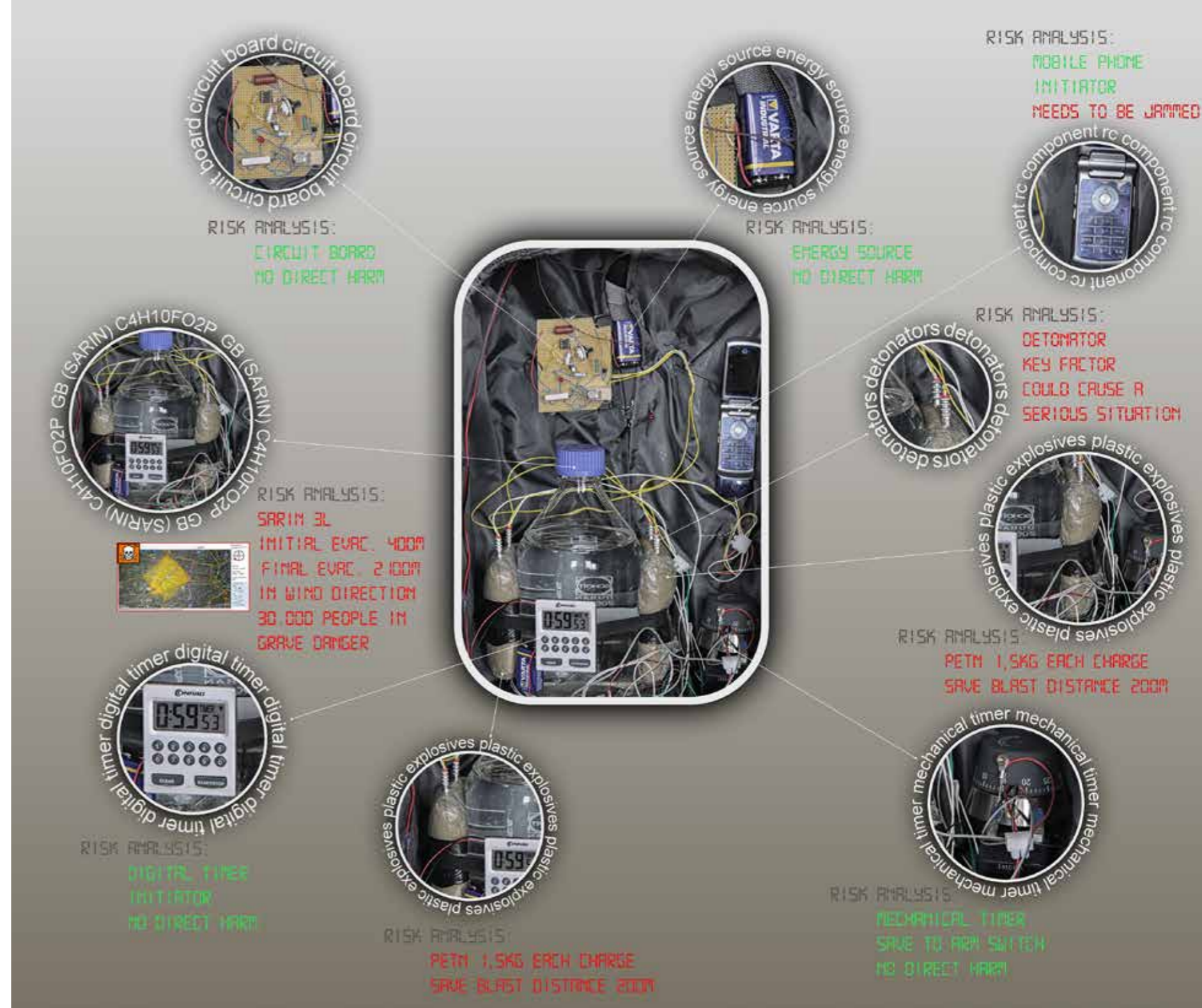
initiated by some action performed by the target. Command initiated IEDs feature some form of separation between the main charge at the Contact Point and the perpetrator initiating it from a distance. Switches can vary from simple egg timers for Time Operated IEDs up to circuitry controlled multiple sensors with the intent to deny bomb disposal operators to render safe the device.

#### CONTAINER

The Container holds all the other components together in a deployable form. It may also serve to disguise the IED as an innocuous object and if it is made from a hard or flammable material, may also contribute to the target effect by producing fragmentation or flame.

#### ENHANCEMENTS

An optional, deliberately added component as opposed to a secondary hazard which modifies the effects of the IED, it could be fragmentation, Toxic Industrial materials or CBRN. Especially the latter are consequently leading to the employment of Manual Neutralisation.





# MANUAL NEUTRALISATION

## THE CAPABILITY

A COMBINATION OF ANALYTICAL THOUGHT PROCESSES AND THE APPLICATION OF MANUAL SKILLS

Being excellent in Electronics, Threat Assessment or X-Ray Diagnostics is not enough. When your fingers are shaking you are not up to it!

Demanding an operator to manually defuse an IED is, and should always be, the last resort. However, in some cases the nature of the device or situation requires to render the device safe manually. These situations are directly linked to MNT. The approach, where a trained operator renders a device safe without any help of remote system or disruptive weapons, is known as Manual Neutralisation Techniques (MNT).

### LIMITS OF TECHNOLOGY

“State of the art” bombs use multiple sensors and switches to initiate sensitive explosives or release CBRN agents, making it impossible to use X-Ray systems, robots and energetic weapons. Sometimes even Infra-Red sources for night vision goggles cannot be used, so bare eye sight is the only option. Open heart surgeries can be supported by robots because of intense lasting preparations and a large number of specialists in the operations room. The principle of minimum personnel in the danger zone and a possible downcounting timer prohibits such an approach. Manual skills, drills and the feedback of fingertips are the only option.

### EQUIPMENT

The equipment consists of a backpack full of standard tools, mostly non-conductive and antimagnetic, a decent multimeter and some specialized gear, but the main factor remains the operator, his comprehensive knowledge, ability for technical analysis, decision making and finally the application of manual skills and drills.

### TRAINING

Unsurprisingly, developing and maintaining the skill levels necessary for such a demanding role requires regular and intense training. Attending the MNT course requires extensive previous training and mission experience which sums up to several years being a member of the EOD community. But having successfully completed it is only the start at a new level of expertise. Permanent Refresher Training, monitoring actual attacks and development of the adversaries technics, tactics and procedures, technology watch on new sensors and equipment as well as additional advanced training is indispensable.

### THE REAL WORK

No heavy bomb suit can be worn as it doesn't protect the operator in the kill zone. If CBRN material is incorporated, respirators, gloves and NBC suits have to be worn. But anything in front of your eyes and on your fingers endangers an already highly dangerous job. Safe waiting times cannot be applied because of the risk of a down counting timer. Having made access to the device circuitries have to be analysed and switches and detonators cut away. To make it even worse this work has to be done in the dark because of light sensitive switches and under the surveillance of movement sensors.

The risk of increased sophistication in the construction and employment of IEDs is significant. Technology cannot do it all yet, therefore, the ability of MNT operators to use their intellect, knowledge and talents is vital.

**MNT Operators are and continue to be needed in both the civilian and the military environment.**



#### THE CHALLENGE:

- COMPLEX TRIGGERS
- MULTIPLE DETONATORS/SWITCHES
- ALL SENSORS ARE POSSIBLE: PIR, LIGHT SENSITIVE, ELECTRONIC...
- CLIPPING & ENTRY
- ANALYSE THE ELECTRIC CIRCUIT
- NEUTRALISE THE DETONATOR OR SWITCH
- ALWAYS AGAINST THE CLOCK!





# CONSISTENT FURTHER DEVELOPMENT OF THE MNT CAPABILITY

STANDSTILL IS NOT AN OPTION...  
KEEPING A STEP AHEAD OF THE ADVERSARY

A wide spectrum has to be taken into consideration  
Latest IED developments, terrorists modus operandi,  
advancing technology, equipment, procedures...

## KNOW YOUR ENEMY

The continuous development of the MNT capability requires concurrent activity in different areas. Among other things, the permanent exposure of the current operational IED capabilities of terrorists and insurgents worldwide. The latest IED developments, instructional materials and technical discussions extracted from terrorist web forums and social networks worldwide have to be assessed, devices recreated and tested against the actual render safe procedures. Conducting tailor-made pre-deployment training requires in-depth knowledge about the adversaries modus operandi, the preferred use of explosives, their technical capabilities and intent of a possible use of CBRN agents.

## LESSONS IDENTIFIED

No training, no exercise can replace a real task. Sharing of information

and mission experience and Lessons Identified is of utmost importance. These have to be analyzed, alternatives developed and tested. If successful they can be implemented into the own course of action.

## HME & CBRN

Home made explosives (HME) produced in the kitchen or bath is the preferred main charge for many attacks nowadays. Some of them cannot be encountered using energetic weapons, applying MNT might be the only solution if the risk of a detonation is not acceptable. Having a vast understanding and knowing what can be done and what must not be done is absolutely necessary.

A CBRN payload might lead to the necessity of wearing dust masks, respirators and other personal protective equipment (PPE). Putting

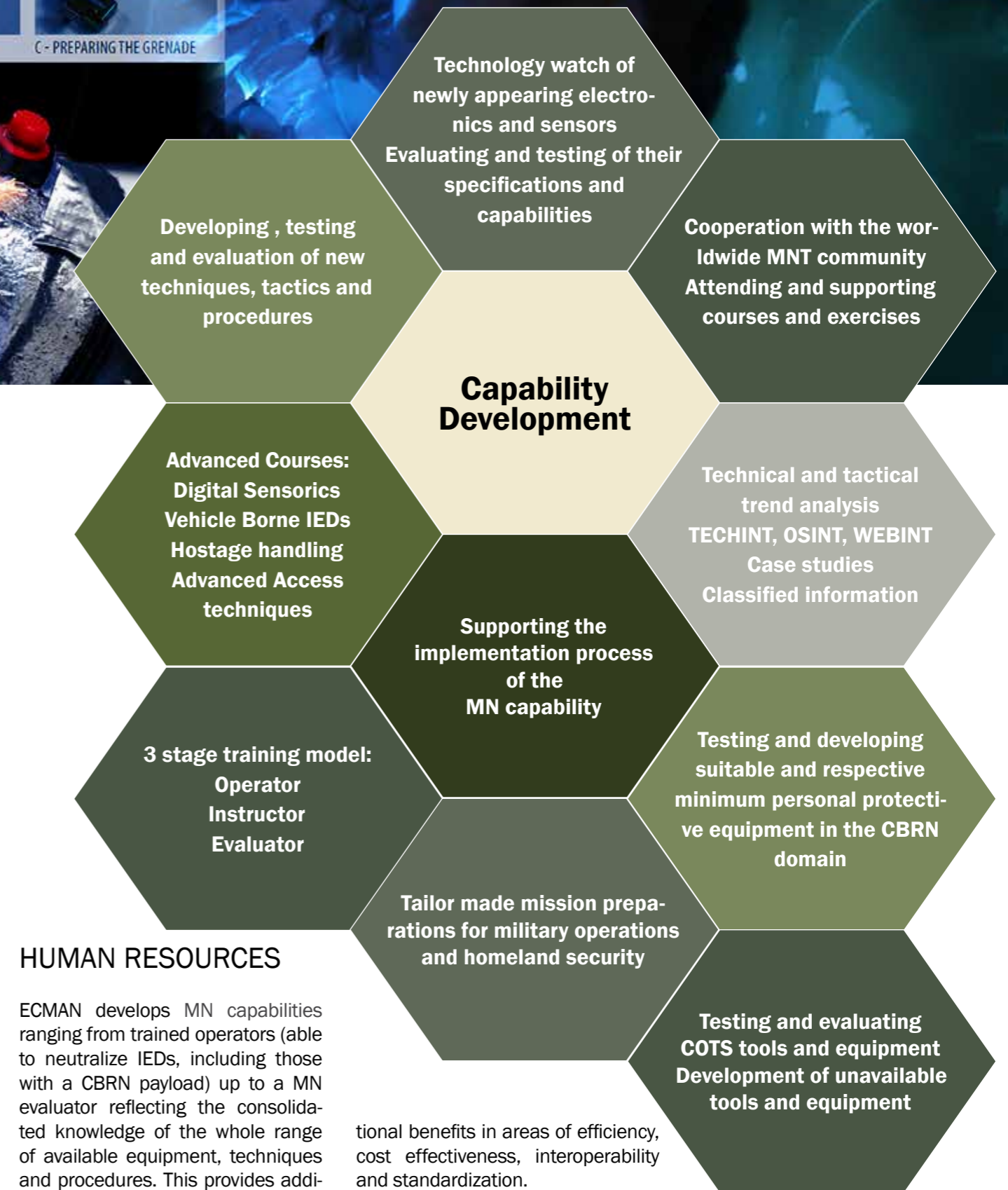
something onto your fingers and in front of your eyes makes an inherently dangerous job even worse. Therefore different kind of PPE have to be tested scientifically against different agents to find out what is the absolute minimum level of protection.

## EQUIPMENT

There is a standardized set of equipment for MNT activities. The majority is readily available commercial of the shelf (COTS) equipment, but of high quality. But there are a couple of specialized tools which were developed with the solely purpose of being used in those activities. But still the operators are missing sometimes small but helpful things which are not available on the market. To develop these and test and validate the newly appearing equipment is one of the ECMAN tasks.



▲ Curse of the Internet  
Terrorist organizations  
put bomb building manuals online



## HUMAN RESOURCES

ECMAN develops MN capabilities ranging from trained operators (able to neutralize IEDs, including those with a CBRN payload) up to a MN evaluator reflecting the consolidated knowledge of the whole range of available equipment, techniques and procedures. This provides additional

benefits in areas of efficiency, cost effectiveness, interoperability and standardization.



repeated background text: european centre for manual neutralisation capabilities



# ECM<sup>1</sup>AN

