

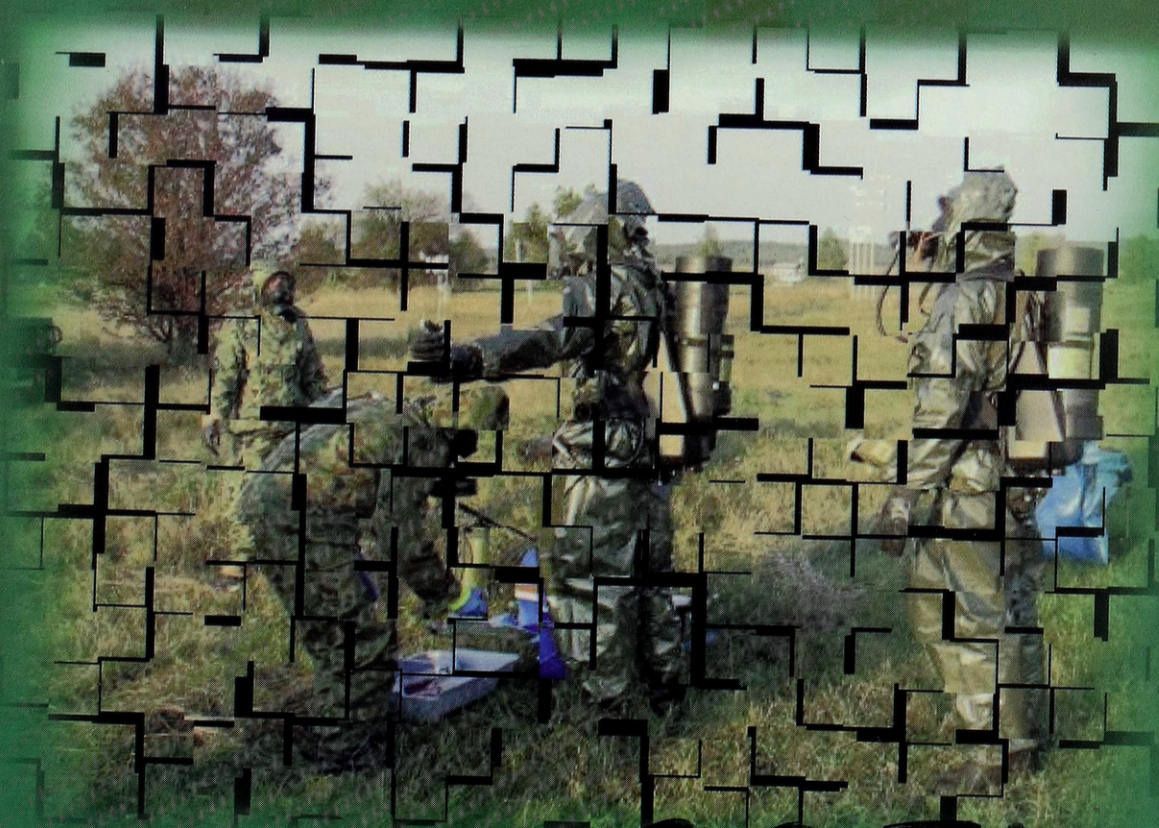


# NBC DEFENCE TRAINING CENTRE



## NBC DEFENCE ORIENTATION COURSE

Student handbook



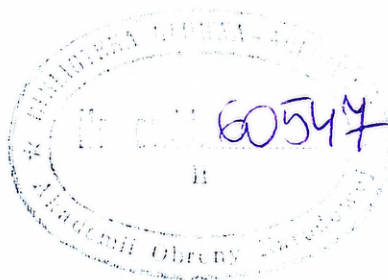
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NATIONAL DEFENCE UNIVERSITY



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NDU 5769/06



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ORIENTATION COURSE**

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**WARSAW 2006**

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**This material, designed to use at  
NBC Defence Orientation Course,  
was prepared by a team led by Leszek Słomka.**

## TABLE OF CONTENTS

1. NBC Defence Training Centre in the Polish Armed Forces.....	5
2. Proliferation of WMD - threat and new challenge. WMD terrorism.....	8
3. National Nonproliferation Policies.....	14
4. Nonproliferation of Weapons of Mass Destruction – International Organizations.....	22
5. CBRN Crisis management .....	29
6. The characteristics and effects of NBC Weapons.....	33
7. Detection, Identification & Monitoring.....	41
8. Physical Protection.....	46
9. NBC Warning and Reporting System.....	48
10. Decontamination System.....	55
11. NBC Medical Countermeasure.....	61
12. BIO Monitoring System.....	63
13. NBC Analysis.....	65
14. Epidemiological Reaction Centre of the Polish Armed Forces.....	67
15. HPAC Overview.....	69
16. Mission, tasks of the Military Institute of Chemistry and Radiometry.....	73
17. Appendices.....	76

## **NBC DEFENCE TRAINING CENTRE**

The NBC Defence Training Centre (NBCDTC) was established in 2004, as a new part of the National Defence University. The project met requirements of NATO policy in the field of NBC/CBRN initiatives undertaken during the NATO Prague Summit. This is a national project widely open to multinational cooperation to strengthen NBC/CBRN Defence capabilities. The aim of the Centre is to direct competence centre for multifarious NBC/CBRN Defence training to address senior military and civilian staff. We provide participants with proper knowledge and practice of the NBC/CBRN matters include training for governmental and local governmental organisations responsible for NBC/CBRN crisis managing. Some courses are open for international participants.

The primary mission of the Centre is to:

- Enhance the national NBC Defence capabilities to address threat coming from proliferation of WMD and terrorism,
- Provide senior civilian staff responsible for crisis managing with appropriate NBC Defence training.

The main tasks are to:

- provide didactic and research activities in the field of the NBC training;
- organise and conduct NBC Defence courses for parliamentarians, senior civilian staff of the parliament, as well as senior civilian staff (government & council level) responsible for taking countermeasures against terrorism and NBC threat,
- create and initiate new NBC Defence courses, and moreover
- maintain co-operation with appropriate NATO and EU agencies and working groups as well as bilateral co-operation with other countries in the field of the Centre interests;
- extend the co-operation with national military and civilian institutions, responsible for the NBC Defence problems.

The Centre is subordinated to the Commandant of National Defence University. The structure of the Centre includes two sections: administration and didactic sections. The core personnel are responsible for efficient didactic, planning, admin and technical work of the Centre. The second (unstable) didactic part of the Centre invites visiting professors and instructors come from many military and civilian institutions to support professional training - MoD, National Defence University, Military Institute of Chemistry and Radiometry, Military Institute of Hygiene and Epidemiology, NBC Defence Departments of all Military Services and others adequately to provide the participants with appropriate knowledge.

Variety of courses (12 categories) is apply many methods from presentations, lectures, seminars, computer exercises, and in future - field exercises. Courses as a main form

of training are dedicated to senior civilian staff (government & council level) responsible for managing crisis involving NBC threat.

All the military courses were specified as a part of officer's professional development system in the Polish Armed Forces. We train all officers' ranks including one-star general (Brigade Commanders).

We conduct 6 types of courses:

- NBC Defence Policy Course – dedicated to senior rank officers (BG, COL) mainly brigade and regiment commanders, chiefs of training on Division, Corps and Service Command level;
- NBC Defence Orientation Courses – for LTCOL and COL of all services;
- The BIO Defence Course – for medical personnel from Military Health Service on Division, and Corps level.

The next three courses we address to NBC personnel:

- NBC Defence Advanced Course;
- Course for personnel of NBC Warning and Reporting System, and finally
- RAD Protection Course – the course authorises participants to take an exam to receive a state certificate.

The second part of our activities includes courses dedicated to civilian participants with many institutions unconnected with the Armed Forces.

We conduct:

- CBRN Defence Orientation Courses – for decision makers and senior staff responsible for CBRN Crisis Management on governmental and local level.
- Basic and Advance NBC Warning and Reporting System Courses according to NATO Policy to harmonise the domestic NBCWR System with the NATO one. So, we provide the civil specialist with appropriate knowledge and abilities to use ATP-45 procedures – manual and automated.

Moreover, we open the course for intentional participants from NATO and PfP countries. We offer several courses in English this year: NBC Defence Orientation Course and NBC W&RS Course.

The main purpose of NBC Defence Orientation Course is to familiarize officers and civilian personnel with basic NATO concepts, guidelines and procedures as well as national solutions concerning all aspects of NBC Defence. The course provides knowledge of CBRN threat, NBC Defence fundamentals as well as NBC Defence System functions, staff responsibilities and NBCWR System guidelines.

The undertaken training activities are focused on:

- a. WMD Threat and Non-proliferation Policy;
- b. CBRN Terrorism;
- c. NBC Defence System in the Polish Armed Forces:
  - NBC Hazard Prediction,
  - NBC Warning and Reporting,
  - Individual and Collective Protection,
  - Decontamination.
- d. BIO Defence and Medical Countermeasures.

The course participants can use functioning facilities such as the library, restaurant, recreation centre, officers' club and hotel.

**Pawel DURYS**

## **PROLIFERATION OF WMD - THREAT AND NEW CHALLENGE. WMD TERRORISM**

### **Introduction**

After the dissolution of the Soviet Union and overcoming the bi-polar confrontation, the international community started the process of adaptation to the evolution of the geopolitical and geostrategic picture. The comfortable cooperative environment of the immediate post Cold War has been replaced by a multifaceted instability condition whose most worrisome expressions are the proliferation of weapons of mass destruction and their delivery means and the international terrorism, both affecting the international security and stability.

The new risks and the emerging threats to security have induced most of the world states to expand their basic task of defence to three key threats:

- proliferation of weapons of mass destruction;
- weapons of mass destruction terrorism;
- failed states;

and four key challenges in a new security environment:

- an increasing influence of non-state actors and the asymmetric threats;
- a quick pace and complexity of scientific and technological developments;
- growing access to WMD related materials, technologies, means of delivery and expertise;
- globalisation and the liberalisation of trade, which fuels economic growth, creates more opportunities for countries or terrorist groups.

### **Proliferation threat**

Weapons of mass destruction and related materials, technologies, means of delivery and expertise are more accessible today than ever. Globalisation and the liberalisation of trade, which fuels economic growth, creates more opportunities for countries or terrorist groups to seek weapons of mass destruction. Non-member states or non-state actors may have difficulty procuring weapons of mass destruction related technology and materials from states parties to the respective treaties (Non-Proliferation Treaty, Chemical Weapons Convention, Biological and Toxin Weapons Convention), but may trade freely among themselves and have no constraints from developing such weapons or transmitting them to the terrorist groups.

Nowadays, the proliferation threat is evolving:

- there are a lot of states that have acquired or are attempting to acquire indigenously a weapons of mass destruction capability;
- we are in the process of the growing trade and technical co-operation between proliferators (secondary proliferation);
- the threat posed by non-state actors is emerging (e.g. private companies, proliferation networks, terrorist groups).

The proliferation has the potential to harm all states as well as proliferators have global reach. The agreed definition of states or non-state actors of proliferation concern is “*those who are engaged in proliferation through: (1) efforts to develop or acquire chemical, biological, or nuclear weapons and associated delivery systems; or (2) transfers (either selling, receiving, or facilitating) of weapons of mass destruction, their delivery systems, or related materials*” (Proliferation Security Initiative – Statement of Interdiction Principles).

### **Threat assessment and response to proliferation of weapons of mass destruction**

As we stressed, there is a consensus among all states that proliferation is a global threat to international peace and security. United Nation’s Security Council Resolution 1540 (2004) of 28 April 2004 expresses “*grave concern*” because of the threat resulting from “*illicit trafficking in nuclear, chemical, or biological weapons and their means of delivery, and related materials*”. It called also “*all states to refrain from providing any form of support to non-state actors that attempt to develop, acquire, manufacture, possess, transport, transfer, or use weapons of mass destruction*”.

Thus, the Euro-Atlantic community stresses the importance of abiding by and strengthening existing multilateral non-proliferation and export control regimes and international arms control and disarmament. Because of weapons of mass destruction can pose a direct military threat to NATO territory, populations and forces, the Alliance principal goal is to prevent proliferation from occurring or, should it occur, to reverse it through diplomatic means (Alliance Policy Framework on Proliferation of Weapons of Mass Destruction – 1994). Ten years later, NATO member states remain committed to address effectively these threats (NAC Istanbul 28 June 2004 “Our Security in a New Era”) and adopted a three-phase approach to deal with the weapons of mass destruction threat:

- to **discourage** and to **prevent** the development or acquisition of weapons of mass destruction;
- when obtained, to **deter** their use or threat of use;
- to **defend** against their use.

## **Weapon of mass destruction**

At the beginning of the 21<sup>st</sup> century the term “weapon of mass destruction” is one of the most popular words in the world. There are also many definitions of weapon of mass destruction. We can define a weapon of mass destruction as:

- any destructive device including CBRN agents;
- poisonous gas;
- any weapon involving a disease organism;
- any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

According to existing four categories of weapons of mass destruction we must clarify very shortly all of them.

1. The chemical weapon definition includes toxic chemicals or chemical munitions intended to cause death or other harm. Chemical weapon agents can be: toxic industrial chemicals, toxic chemicals and military use chemicals.

2. The biological weapon definition includes microbial or other biological agents, or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes. It also covers weapons, equipment, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict. Biological weapon agents can be: pathogens, rickettsias, or toxins.

3. Radiological dispersal device definition includes radioactive material placed together with low order explosives that are designed to disperse material over a large area by weather conditions. It also employs highly radioactive isotopes.

4. Nuclear materials definition includes fissionable and other radioactive weapon materials.

## **Advantages and disadvantages of weapons of mass destruction**

All mentioned earlier categories of weapons of mass destruction have their own characteristics that influence advantages and disadvantages to use a particular kind of weapon. Some categories of weapons of mass destruction may cause casualties (incapacitate or kill), panic, chaos, and terror. The effects of its use are rapid and the cost of production inexpensive. On the other hand, they can be dangerous to the maker and user, need expertise and special equipment to produce in large quantities as well as protective equipment and special handling. The most powerful is nuclear weapon. It is a high impact weapon and can pose mass casualties, damage to a country 's economy and long-term environmental damage.

## **Physical forms, dissemination devices and sources of weapons of mass destruction materials**

According to chemical and physical characteristics of weapons of mass destruction, each category of such weapon can exist in different forms or with a specific individual physical form. The most popular are aerosols, solid, or liquid forms. Aerosol is dispersed as a fine mist or gas (chemical or biological). Solid forms of weapons of mass destruction can be dispersed as powder, granules or other solid forms. They are typical for some chemical agents, many biological agents, and most radiological agents. The last form is liquid. Many chemical agents and some biological agents are designed to be disseminated in that form.

The dissemination play crucial role devices. They are categorised by the method and form in which they release an agent. They include i.e. breaking devices, bursting or exploding devices, mechanical devices, vectors, or standard munitions and launch platforms.

One of the most important question related to the issue of proliferation is how proliferators or terrorist groups can posses some weapons of mass destruction. Among different sources of weapons of mass destruction we can indicate:

- poorly secured weapons and / or research programs;
- states with a profit or proliferation motive;
- orphan and found materials;
- stockpiles made vulnerable through privatisation.

## **Terrorism, definition of terrorism and weapons of mass destruction terrorism**

As we stated in the case of weapon of mass destruction, there are a lot of definitions related to the term of terrorism. We can define terrorism as violent acts or acts dangerous to human life that are a violation of criminal laws and that appear to be intended to intimidate or coerce a civilian population, or to influence the policy of the government by intimidation or coercion. Terrorists movements can include individual extremists, formal terrorist organisations, state sponsors of terrorism and Global Jihad Movement.

What is the definition of weapons of mass destruction terrorism (superterrorism)? Superterrorism has no precise definition, has been widely used to denote the use of chemical, biological, radiological and nuclear weapons by terrorist groups.

Since the 1990's there is growing evidence terrorists (terrorist cult Aum Shinrikyo, Al Qaeda) seeking ability to use chemical, biological, radiological and nuclear materials to cause mass casualties, instil panic and confusion, overwhelm emergency response systems or influence national government decision. They can be supported by some states sponsors of terrorism have programs to develop weapons of mass destruction.

## **Terrorist incentives and disincentives to use weapons of mass destruction**

Why did politicians and experts expect weapons of mass destruction terrorism or why the weapon of mass destruction can be useful for terrorist purposes? There are many incentives to use weapons of mass destruction. Among them we can stress:

- small size of weapon and possibly small investment equals large result;
- psychological damage;
- demonstrate the inefficiency and ineptitude of the government and as a consequence – loss of public confidence;
- trauma associated with being a victim can inhibit proper medical care;
- shift spending from offensive operations to defensive preparation.

On the other hand, we must remember that there are also some incentives to use weapons of mass destruction i.e.:

- can inhibit support and recruitment depending on target and casualties;
- creates willingness to retaliate against the terrorists and sponsors;
- some weapon of mass destruction attack methods difficult to control.

## **Evaluating the risk of weapons of mass destruction terrorism**

One of the most important questions is the possibility of coming into possession weapons of mass destruction by terrorist groups or developing of their own chemical, biological, radiological or nuclear agents. These two factors evaluate the risk of weapons of mass destruction terrorism. Nowadays ten factors promote the use of weapons of mass destruction:

- availability of civilian nuclear facilities;
- availability of plutonium;
- availability of precursor chemical substances;
- availability of (unemployed) scientists;
- the information revolution;
- close relations between organised crime and terrorist groups;
- easy concealment and transport of weapons of mass destruction;
- urbanisation has increased targets
- detection and countermeasures often difficult;
- genetic biotechnology offers the possibility of ethnic targeting.

## Conclusions

1. There is a wide range of weapons of mass destruction and their means of delivery in modern world. Because of complications of weapons of mass destruction limit widespread use, the likelihood and impact of weapons of mass destruction incidents can be variable. But potential outcomes can be significant.

2. The link between proliferation processes, weapons of mass destruction and terrorism is real and credible. Incentives for terrorist groups to pursue weapons of mass destruction and for proliferators to sell chemical, biological, radiological and nuclear agents can be countered with active measures to decrease the favourability and increase the cost.

3. A coordinated, international approach is required to address the proliferation / weapons of mass destruction / weapons of mass destruction terrorism threat.

## **NATIONAL NONPROLIFERATION POLICIES**

### **1. Introduction**

On the beginning of XXI century, regardless transformation of international relations as well as partial change in functioning of international community, there are still many factors having its roots in previous century that imply the current types of threats for international security. These factors could be called as decisive trends in international relations. These trends facilitate the transformation of existing contradictions and collisions of interests into real threats for international security. Phenomena of developmental disproportions, globalization of interests of increasing number of states and dimensions, uncontrollable spread of Western culture are the factors intensifying these contradictions, what were manifested by growing number of security threats. In the background of current security threats unequivocally we can put internal conditions in the states – which finally define the kind of achieving the interests and types of reactions on existing contradictions.

From that perspective WMD proliferation is a part of broader international system, where countries, groups of countries as well as non-state actors tend to defending their interests also through the partial contestation of current World Order (understood as the system of defining the position of countries by previously accepted rules and conditions – including system of WMD nonproliferation). WMD proliferation is one of many new threats that could be perceived and analyzed in the same manner. We can add to this list international terrorism as well as tendencies to preserve or expand the developmental disproportions in world economy. Perceiving the significance of WMD threat in different countries is dependent not only on direct military threat, but also is defined by broadly understood benefits for each country taken form functioning in current “status quo” in terms of system of disarmament agreements and in broader context of current international relations.

Aimed at clarity of lecture layout the WMD term is understood and used jointly with its means of delivery, especially with ballistic missiles able to deliver WMD warheads.

### **2. What is the role of WMD proliferation in international security?**

WMD represents enormous threat for whole international community. Proliferation of WMD gives more deadly tools for all state and non-state actors that want or will attempt

in the future to threat or blackmail by using it. Especially the asymmetric or terrorist use of WMD is for all states the threat very difficult to face.

**Deterrence.** From the end of WWII countries legally allowed to poses nuclear weapons have established its deterrence strategies on nuclear capabilities. During Cold War time, in case of United States and Soviet Union it was based on Mutually Assured Destruction theory. Other three members of “nuclear club” (China, Great Britain, and France) use nuclear capabilities for its own deterrence strategies not exactly assigned to prevailing block vs. block deterrence thinking. Additionally, U.S. and UK nuclear capabilities played crucial role in whole NATO deterrence. Aimed at preserving strategic balance between two blocks in the Cold War period, Big Five countries relaying on NPT Treaty as well as on arms control agreements – mostly between U.S. and Soviet Union.

From the beginning of 90-ties the deterrence “environment” was dramatically changed. The baseline for Cold War deterrence based on nuclear power was the accountability of potential adversary and minimum level of strategic reliability in assessment undertaken before any potential aggression. But situation was changed when nuclear deterrence should be enough answer on the threats posed by countries leaded by unpredicted leaders without real democratic control. In previous situation the dominant factor of Cold War rivalry, including arms race, makes this tendencies invisible and ineffective. XXI century’s strategic concepts of nuclear powers were expanded on additional sub-strategies aimed at preserving the effectiveness of deterrence towards new types of threats. Dissuasion and strategic ambiguity as well as strategies of preventive actions are established and were executed in very close link with WMD proliferation threats and changes in deterrence effectiveness.

**World Order.** It seems that regardless the acquisition of nuclear capabilities by few additional countries (India, Pakistan, Israel) to the end of Cold War, the threat of proliferation of nuclear weapon was not perceived as the most real threat for international stability. From the beginning of 90-ties the situation was change in all dimension. Firstly, the collapse of Soviet Union could imply dramatic increase of number of nuclear states. Secondly, the globalization factor simplified the possible attempts to acquire know-how and materials related to WMD. Thirdly, the international order at that time (multilateralism as dominant approach in preserving international security, expanding security dimensions) provoke or facilitate many “states of concern” or non-state actors to looking for WMD as a valuable tool in improving their international position, achieving the interests which were frozen during Cold War or just using it to preserve dominance in internal politics.

Taking above situation into account we can easily asses that nuclear powers and the Euro-Atlantic community have the perspective that: system of WMD nonproliferation based on NPT Treaty and other legal infrastructure, if undermined, could pose difficulties in preserving the current World Order.

### 3. What measures can states take against this threat?

Concerning possible dimensions of international organizations and state WMD nonproliferation policies it is very beneficial to explore firstly its linkage with states' foreign policy and analyses of states' security policy.

Dimensions of international organizations and state WMD nonproliferation activity:

#### **Legal**

- establishing of general norms in international law (*ius cogens*);
- adopting international agreements;
- establishing internal law supporting countering WMD proliferation;

#### **Political and diplomatic**

- shaping the political will to adopting legal tolls for non-proliferation as well as shaping the political will to react of non-compliance behaviours;
- building the political atmosphere underlying significance of undertaking appropriate methods and actions in WMD non proliferation;

#### **Economic**

- executing and promotion among trade partners the prohibition of WMD components or dual-use goods exchange;
- executing or promoting general trade sanctions aimed at limitation of financial capabilities to produce or acquire WMD or components to its production as well as aimed at proliferator's policy and behaviour redefinition;

#### **Military**

- providing reconnaissance of states and non-state actors WMD related activities;
- developing political-military cooperation as well as financial and know-how support to other countries in elimination of WMD;
- using military power projection as an argument to change proliferator's policy;
- using military capabilities to prevent (interdict) acquisition of WMD related materials;
- using military forces to disarm and implement the nonproliferation policy of the proliferator.

Dimensions of nonproliferation and counter-proliferation activities listed above are mutually interdependent and very rarely exist individually.

#### **4. Review of states WMD nonproliferation policies**

##### **United States nonproliferation policy**

Current United States administration assessment of threat and countermeasures against WMD proliferation comes to the conclusion that regardless existing system of arms control and nonproliferation agreements the WMD as well as diplomatic and political efforts the threat is growing. WMD threats implied by this situation, controllable during Cold War period, nowadays have fully new character. From U.S. perspective last decade has shown that the effectiveness of arms control and nonproliferation legal system has been decreased. Such assessment becomes the baseline for important modifications in U.S. nonproliferation policy. In consequence, U.S. security policy has moved from so called "classical" prevention and nonproliferation to counter-proliferation, pre-emption, sanctions as well as advanced weapon systems. Moreover, taking into account current international atmosphere that mostly accepts or tolerates such policy, above transformation means also focusing more on unilateral policy exploring international cooperation to achieving planned goals than the classical multilateralism. One of the last examples is adopting by UN Security Council Resolution 1540 on WMD nonproliferation, what stresses the threat of non-state actors acquisition of WMD and urges the states to improve WMD physical protection, including cooperation between law enforcement services. Adopting this resolution was strongly linked with widely promoted by U.S. the Proliferation Security Initiative in which identified limitations in executing international cooperation in interdictions of illegal shipment of WMD or related materials.

In the context of unilateralism in U.S. nonproliferation policy we can perceive U.S. unilateral withdrawal from Anti-Ballistic Missile Treaty (ABM) in June 2002. The sense of adopting U.S.-Russia Strategic Offensive Reduction Treaty (SORT) from May 2002 can be read in the same way. It is important to recognize that regardless poor references to START I verification procedures, the SORT Treaty has not verification measures as well as any commitments for physical elimination of dismantled nuclear warheads. The experience of last decade shows that U.S. policy aimed at improvement of WMD nonproliferation does not rely on formal / legal instruments in this regard. Looking wider, it is also the influence of a new U.S. military strategy that requires freedom of action – necessary for implementation of this strategy. Therefore, in context of effective WMD nonproliferation policy, the biggest significance for U.S. poses:

- directing nonproliferation policy at certain countries which do not comply with international norms (so called: states of concern) or require assistance in establishing effective export control system (i.e. former Soviet Union states); and
- continuation of Russian WMD arsenals reduction or elimination with full participation and control of international community.

Above identified general guidelines correspond with U.S. assessment of highest proliferation threats, what are: (1) acquisition of WMD systems by states of concern or terrorist groups, (2) development of ballistic missile programs in the Middle and Far East. Therefore, the nonproliferation factor has a valuable place in U.S. policy towards main international actors:

- in U.S.-Russia relations (reduction of Russian WMD arsenals, Russia-Iran cooperation in nuclear technology);
- in U.S.-China relations (arms export control, especially in regards to ballistic missile technology); and
- in U.S. policy towards European and Asian allies (cooperation and support for deploying U.S. Global Ballistic Missile Defence System, cooperation in new initiatives on practical nonproliferation activities).

### **U.S. concept of counter-proliferation**

From the mid of 90-ties the concept of counter-proliferation receive the higher attention in U.S. political-military elites and is understood as active military answer on WMD proliferation, including wide number of alternatives of defensive and offensive military means. In last few years U.S. adopted few official documents that confirms the significance of counter-proliferation in U.S. security policy (there are: National Security Strategy, Nuclear Posture Review, National Strategy of WMD Counter-proliferation). Also in practice, many of U.S. federal departments and agencies were incorporated into counter-proliferation activities, what concentrates on:

- situation in former Soviet Union states, especially in regard to nuclear scientific institutes and nuclear power plants;
- countering acquisition of dual-use materials, technology and weapon systems by Iran;
- WMD proliferation threats in Greater Middle East: especially countering acquisition of radioactive materials, components for Biological or Chemical Weapon by governmental or non-governmental institutions linked with terrorist groups;
- situation in South-East Asia, including India-Pakistani's arms race as well decreasing broader WMD proliferation potential from that region; and
- political support and law enforcement cooperation for WMD arms control regimes, as: Nuclear Suppliers Group, MTCR and Australian Group.

Very characteristic for current U.S. policy of nonproliferation and counter-proliferation are minor but distinctive changes in so called: "**Negative Security Assurances - NSA**" – mechanism based on NPT Treaty and latter commitments made by NPT nuclear states that have guaranteed non-use of nuclear weapons against NPT parties which committed to do not poses such weapon. First time U.S., UK and Soviet Union issued such assurances

in 1978. In last few years U.S. have confirmed it many times, but U.S. official documents confirmed NSA have not contained so clear statements – what supports doubts about real meaning of it for U.S. Practically, such differences were based on tendency in American political leadership to preserve role for nuclear weapon in deterring potential adversaries from use any type of WMD. Such tendency, especially visible during both Persian Gulf wars, facilitates adoption by Washington so called “policy of intentional strategic ambiguity” – what is clarified as a strong U.S. attachment to the NSA for all non-nuclear states with simultaneous ambiguity on character of U.S. military answer on the attack against United States with use of any type of WMD.

### **China’s nonproliferation policy**

In every occasion China underlines its affection to nonproliferation of WMD and its means of delivery stressing the China’s activity in nonproliferation and export control regimes. Regardless permanent tensions between United States and China in nonproliferation of ballistic missile weapon systems and technology, in last few years Beijing adopted in its legal system additional export control mechanisms, including:

- missiles and missile technology;
- biological dual-use components, technology and equipment for its production; and
- certain chemicals and technology and equipment for its production.

In 2002 China strongly announced that as the first of five nuclear states, China implemented procedures aimed at fulfillment of Additional Protocol to NPT Treaty (formally: Additional Protocol to the Agreement between PRC and IAEA on Additional Safety Measures in China). Adoption of these regulations paves the way for better U.S.-PRC relationship in this regard, which could be build on the (partial till now) fulfillment of China’s promise to implement effective export control of weapons and military technologies done in 2000. In current U.S. proliferation assessment, there is still many dangerous activities of Chinas companies, which share the WMD technology omitting, adopted regulations.

One of the crucial parts of China’s WMD nonproliferation policy is strong attention to establishing or strengthening multilateral mechanisms. China actively participates i.e. in United Nation Intergovernmental Group of Experts on Ballistic Missiles, as well as took active part in work on establishing International Code of Conduct against Proliferation of Ballistic Missiles (current abbreviation: HCOC) and in debate on Russian proposal to establish Global Control System devoted to the same issue. It is also important to mention China’s deepening dialogue in the framework of Missile Technology Control Regime (MTCR) developed in last few years. China being apart the MTCR (but from few years applies to become a member) is going to make all possible changes in arms control regulations to not being accused by MTCR members as an important missile technology proliferator. From other hand, there are many examples of Beijing

activities that make strong concerns in Western community, specifically related to cooperation in missile technology with Iran and North Korea. US assessment does not exclude the possibility of PRC's sharing with these countries the so called "countermeasures technology" devoted to lowering efficiency of ballistic missile defence systems.

### **Russia's nonproliferation policy**

From the beginning of current decade, Russian WMD nonproliferation policy poses higher internal and external importance due to globalizing threat of WMD proliferation, what in the context of terrorist use of WMD is for Russia extremely crucial. Russian general approach to strengthening WMD nonproliferation efforts stress the need of multilateral cooperation aimed at:

- increasing the role of NPT Treaty and efficiency of control system executed by IAEA;
- improving safety measures in nuclear and radioactive materials storages and implementation of new technologies in this regard.

Last years exemplify high attention paid by Russia to its initiative on final solution of WMD proliferation and improvement the situation in proliferation of missiles and missile technology – proposed during United Nations Millennium Summit in 2000. At the beginning of current decade, Russia promotes also initiative of establishment the Global Control System for aimed at nonproliferation of missile technology. Also nowadays Russia tried to promote many ideas from this initiative at HCOC forum.

Russia as a party of NPT Treaty, declare the greatest attachment to NPT as the pillar of international stability and nonproliferation efforts. In participation of strengthening the NPT regime, Russia especially reaffirms its role in countering proliferation of WMD into terrorist hands. At the same time, commonly with U.S., Russia is blamed on lack of progress in disarmament in tactical nuclear weapons – as an element of agreed in 1995 13-steps on the way to nuclear disarmament. Do not going into details, the role of tactical nuclear weapons in Russian military doctrine is grooving from the mid of 90-ties and is the subject of strategic debate with U.S. as well as with NATO.

From the strategic point of view, Russia still perceives its nuclear arsenal as an important element of preserving strategic balance towards United States and uses this aspect of bilateral relations as one of the last crucial argument of being treated as superpower. Regardless other factors pushed Russia to sign SORT Treaty (lack of financial assets for maintenance of so huge nuclear arsenal, chance to spend saved funds for modernization of its arsenal, preserving commonly with U.S. dominant position in nuclear power), this Treaty situated Russia as key world player again and not only in military domain, but in wider strategic context (with SORT Treaty was signed The Common Declaration

related to many strategic and political issues). Remembering U.S. withdrawal from ABM Treaty at the same time, we can look at the SORT Treaty reduction of nuclear arsenal as wider understanding of current role of nuclear power what enlighten both parties, also Russia.

At the same time, Russia is the subject of multilateral efforts aiming at implementation of Russia's commitments to reduce nuclear arsenal and eliminate chemical weapon. The need for dismantlement of huge numbers of Russian WMD faced deep problems mostly based on internal financial, organizational and technological difficulties. Also, the fact of long-term storage of dismantle WMD makes itself a risk in many areas: from threat of covered proliferation to the contamination of surrounding areas.

Taking above into account, from 90-ties the priority of Western community became lowering the risk of possible transfer of dismantled Russian WMD to other countries or non-state actors. Regardless of different interests staying behind this cooperation, politically, it was very stabilizing factor in terms of whole West-Russia relations especially in 90-ties. There are many mechanisms of support for Russia. Mostly, different countries establish with Russian government projects devoted to exact objective, which is financed from external sources. The biggest donator is of course United States – what during President Clinton administration only spent about 6 billions USD. At the same time European countries spent about 1,5 billions USD. The biggest initiative in this regard is Global Partnership Initiative started in 2002 by G-7 countries commitment to spend 20 billions USD until 2012 on WMD disarmament programs in the former Soviet Union countries. Identifying current priorities of above mentioned support we can list:

- secure all vulnerable stocks of weapons-useable nuclear material by taking steps to resolve outstanding access issues in Russia to clear the way for security upgrades at all Russian warhead and materials facilities;
- secure dangerous biological pathogens, by urging Russia and the other former Soviet states to accept cooperative security upgrades at civilian and military facilities storing dangerous biological agents;
- complete chemical demilitarization, by complete chemical weapons destruction facilities in Russia. In particular organize international support for construction of additional destruction facilities; and
- expand scientist redirection efforts by increase financial support for scientist redirection efforts both in the former Soviet Union and globally.

Russian nonproliferation policy is also its role in solving the North Korean nuclear crises as well as Iranian nuclear crises. In both cases the common value of Russian role is the strong political influence on behaviour of this counties and readiness to offer multiple and politically more acceptable assistance in reducing the risk of military use of radioactive materials by Iran or North Korea.

**Piotr Pacholski**

## **NONPROLIFERATION OF WEAPONS OF MASS DESTRUCTION – INTERNATIONAL ORGANIZATIONS**

### **United Nations nonproliferation activity**

Regardless overwhelming transformation in international security what we can observe from two decades, the role of United Nations in WMD nonproliferation is still obvious and crucial. The efficiency and practical ways of UN nonproliferation efforts have been changed from the begging, but it still remains one of the pillars of nonproliferation system in legal, political and practical terms.

As one of only few international organizations (because of its universal and primary character) United Nations conduct nonproliferation activity on the global scale. In its day by day functioning, WMD issues are mainly elaborated by:

- First Committee (for disarmament and international security);
- United Nation General Assembly and its Commission for Disarmament;
- Conference on Disarmament in Geneva.

But, assessing practical significance of each of UN system institutions and passing over for a moment UN supportive role in reviving processes of main nonproliferation treaties, it is needed to underline that the role of UN Security Council, Conference on Disarmament in Geneva and International Atomic Energy Agency (IAEA) remain crucial.

UN Security Council dealt with WMD issues on many direct and indirect methods. Firstly, UN SC become first and natural forum in case of international crisis with WMD background. Mostly, in that cases UN SC issues resolution that creates international community strategy for peaceful solution of the crisis, but quite often with legitimization of use of force in the worst case scenario (one of the examples was crises on Iraq's WMD program). It is also happen that in early stage of crisis or in predicted crises, UN SC *de facto* legitimize conducting by country or group of countries the peaceful methods in solution of international disputes (one of the examples is six-party talks on nuclear crises in North Korea). United Nation takes also steps for implementation of UN SC resolutions by establishment of UN special institutions. In regards to WMD nonproliferation the examples are establishing of UNSCOM and UNMOVIC that were aimed at practical implementation of UN SC resolution on elimination of Iraqi WMD.

Conference on Disarmament in Geneva - consisted by 44 nations with special interests in disarmament - permanently works on expanding its negotiation mandate on important gaps in system of disarmament agreements. As a very efficient forum for preliminary debate on acceptable negotiation areas key nonproliferation actors put at the table initiatives

on: Fissile Material Cut-Off Treaty, Prevention of Arms Race in Outer Space Treaty, as well as on initiatives aimed at decrease the threat posed by radiological weapon and strengthening Negative Security Assurances for Non-Nuclear Weapon States.

### **NPT Treaty and role of IAEA, CTBT Treaty**

NPT Treaty, adopted in 1968, prohibits Nuclear Weapon States from transfer nuclear weapons or other nuclear explosive devices, as well prohibits the support or encourage any Non-Nuclear Weapon State (NNWS) to production or acquisition in other ways the nuclear weapon or nuclear explosive devices. NPT Treaty prohibits also NNWS the production or acquisition in other ways this weapon or devices, as well prohibits export of nuclear materials and related equipment to NNWS. NNWS are obliged to sign with IAEA agreements on full safety measures that designed to prevent any transfers of nuclear material and equipment form civil to military purposes. There is established system of NPT Review Conferences each 5 years - prepared by Preparatory Committee meets each year in 3 years before Review Conference.

In assessment of most of the states being NPT Parties, the NPT Treaty passing through the crisis. Of course, the arguments used by countries or group of countries are contradictory and could be the best explanation of the most important problems defining such crisis. To the NPT problems of higher international attention we can include:

- implementation of NPT Article VI on nuclear disarmament based on progress in so called "13 steps towards the full nuclear disarmament";
- IAEA efficiency level in nonproliferation efforts towards states of concern;
- legal and strategic aspects of possible withdrawal form the NPT Treaty.

**Comprehensive Test-Ban Treaty** was negotiated on conference on disarmament in Geneva and formally accepted by UN General Assembly voting in 1996. After that, it was open to sign in September the same year. Till now CTBT was sign by 176 countries, ratified by 132 countries, but only by 34 from required 44 parties that poses capabilities in nuclear tests. The main objective of CTBT Treaty is further limitation of developing or modernization of nuclear weapons by nuclear weapon states as well as NNWS.

The main areas of difficulties regarding CTBT entering into force is:

- lack of acceptance in current U.S. administration of ratification the CTBT formally explained by poor verification procedures in the CTBT;
- NNWS claims on preferences for NWS that poses capabilities for simulation of nuclear tests.

**Nuclear Weapons Free Zones (NWFZ)** are the important achievement in nonproliferation efforts from the end of WWII. The strategic reason for establishing such nonproliferation instruments during Cold War period was the geographical limitation of nuclear arms race. Parties of NWFZ commit not to undertake research, production, and possession or control

of nuclear weapons. Part of currently active NWFZ demand from its Parties adoption of additional safety agreements with IAEA. Quite often, Nuclear Weapon States confirm toward NWFZ Parties the Nuclear Security Assurances. The still high value of this instrument confirms the fact that also nowadays at least five potential NWFZ are under discussion: in North-East Asia, Central Europe, Middle East and in the South Hemisphere.

### **NATO and European Union WMD nonproliferation activities**

#### **NATO**

Based on increasing WMD proliferation threats from the beginning of 90-ties NATO established a set of internal bodies dealt with this issue from the political and military point of view. The North Atlantic Council (NAC) meeting in Istanbul in June 1994 laid out guidelines for the development of an agreed NATO strategy on nonproliferation. The ministers stressed that, in keeping with NATO tradition, any solution must have both a political and a military dimension. Accordingly, two committees were created to develop NATO's nonproliferation policy: the Senior Political-Military Group on Proliferation (SGP) and the Senior Defence Group on Proliferation (DGP).

#### **The Political Dimension**

The political dimension of NATO's approach involves the traditional nonproliferation goal of preventing proliferation from occurring in the first place. The primary focus of such nonproliferation efforts is outside of NATO, in other organizations and regimes to which NATO and its member states contribute - including the United Nations and the Nuclear Nonproliferation Treaty (NPT) regime. The Alliance acts as one more venue for discussion and coordination of efforts in this regard. Another aspect of the political dimension involves NATO's neighbours to the East, educating these states as to the dangers inherent in the proliferation problem and working with them to develop mutual programs to stem the spread of WMD materials and knowledge.

NATO discussion on the political dimension of proliferation focused on SGP. The SGP, comprised of representatives of each member state, stressed its work on considering the political, security, economic, and other factors that which drive states desires to want to for acquiring weapons of mass destruction. It undertook a geopolitical, strategic approach to proliferation, considering the sources of conflict and the underlying causes of proliferation desires by states. The SGP then turned its attention to the instruments available to NATO and its member states to discourage proliferation by affecting a would-be proliferator's motivations. Additionally, the high attention is devoted to cooperation on nonproliferation with Russia, Ukraine and in the framework of Euro-Atlantic Partnership Council.

### **The Military Dimension - DGP**

The military dimension of the Alliance ism focused on possible responses or solutions to proliferation or the possible use of a weapon of mass destruction, either against NATO or one of its members, or on NATO's borders. NATO hoped thereby to strengthen the deterrence capabilities of its military forces, showing a potentially hostile country that it could not coerce the Alliance through the use or threatened use of WMD.

The DGP co-chairmen included one North American and one European on a rotating basis. NATO determined in the DGP work that its defence response to proliferation risks should be guided by the following principles: ensuring Alliance cohesion, maintaining freedom of action, reassuring allies and partners, ensuring effective consultation, complementing nonproliferation efforts, complementing nuclear deterrence, ensuring a balanced mix of capabilities, prioritizing needed capabilities, controlling all phases of conflict, evolving capabilities as the threat evolved, emphasizing system mobility, and integrating NBC-related concepts into planning.

During last decade there were plenty of initiatives on **improve NATO NBC defence capabilities**, the most important are:

- NBC Defence Initiatives from 1999;
- Prague Capabilities Commitments from 2002 (in part devoted to NBC);
- Multinational CBRN Battalion as the part of NATO Response Force, from 2004.

### **European Union**

**WMD nonproliferation as permanent part of EU CFSP and CSDP.** Nonproliferation and disarmament issues have historically been difficult for European Union (EU) member states to coordinate. Not least, this is because some are also members of NATO, while others are not. In addition, the division between the EU's two nuclear weapon states, France and UK, and the other member states has hindered agreement on substantive common positions or statements in international disarmament or nonproliferation fora. Recent events have support efforts to address these challenges more efficiently within the EU. EU recognizes that WMD threats must be addressed, but in contrast to the massive WMD threat in the Cold War period, the new WMD threats are not strictly military and can not be solved by purely military means.

**The EU nonproliferation framework** is based on strategic documents devoted to this activity: „Basic Principles for an EU Strategy against Proliferation of Weapons of Mass Destruction” and an „Action Plan for the implementation of the Basic Principles for an EU Strategy against Proliferation of Weapons of Mass Destruction”. Both reaffirm the importance of international nonproliferation rules through international law and multilateral organizations as UN, while also according with EU's members concerns in addressing immediate proliferation challenges and possible terrorist uses, especially in the Middle East. The European Commission has also gained expertise in recent years in the context

of the EU's „Nonproliferation and Disarmament Cooperation Initiative”. This is financed by EU resources related to the Common Foreign and Security Policy and fulfill the EU commitment to spend 1 billion Euros in ten years that was pledged to the G-8 Global Partnership against the proliferation of WMD.

**EU main areas of nonproliferation activity are:**

- universalisation of disarmament and nonproliferation agreements while stressing the importance of effective national implementation thereof;
- ensuring compliance with nonproliferation commitments by making the best use of, and, when appropriate, strengthening international inspection/verification mechanisms;
- strengthening export control policies;
- introducing a stronger nonproliferation element in relationships with some partners;
- having a focussed dialogue both with countries suspected of proliferation activities and with those whose co-operation is vital to effective policies against proliferation;
- expanding co-operative threat reduction initiatives and assistance programs;
- ensuring that appropriate resources and support are allocated to international organizations and arrangements active in nonproliferation such as the IAEA, the OPCW, the CTBTO, NPT Treaty, and HCOC;
- promoting close co-ordination with the United States;
- pursuing an international agreement on the prohibition of the production of fissile material for nuclear weapons;
- considering, in case political and diplomatic measures have failed, coercive measures, including as a last resort the use of force in accordance with the UN Charter.

More EU's work is expected in fleshing out the future of the nonproliferation regimes. Moving ahead on export controls will be easier than the difficult issues that are discussed at the NPT Preparatory Committee in 2003-2005 and that will definitely result from any challenge inspection under the CWC. Regarding North Korea and Iran EU will keep nonproliferation in the priorities but the outcomes in each case could be unpredictable.

**Other multilateral mechanisms of nonproliferation**

Regardless multilateral arms control and disarmament agreements related to WMD nonproliferation, a very significant part of international efforts in this regards are export control regimes on WMD, as:

- Australian Group;
- Nuclear Suppliers Group;
- Missile Technology Control Regime.

**The Australia Group** is an informal arrangement which aims to allow exporting or transshipping countries to minimize the risk of assisting chemical and biological weapon (CBW) proliferation. All states participating in the Australia Group are parties to the Chemical Weapons Convention (CWC) and the Biological Weapons Convention (BWC), and strongly support efforts under those Conventions. The Group meets annually to discuss ways of increasing the effectiveness of participating countries' national export control measures to prevent proliferators from obtaining materials for CBW programs.

Participants in the Australia Group do not undertake any legally binding obligations: the effectiveness of their cooperation depends on a shared commitment to CBW non-proliferation goals and the strength of their respective national measures. Key considerations in the formulation of participants' export control measures are:

- they should be effective in impeding the production of chemical and biological weapons;
- they should be practical, and reasonably easy to implement, and
- they should not impede the normal trade of materials and equipment used for legitimate purposes.

**The Nuclear Suppliers' Group (NSG)** consists of 30 nuclear suppliers and seeks to control exports of nuclear materials, equipment, and technology, both dual-use and specially designed and prepared. Russia is a member of this group and therefore bound by its controls, though other former Soviet Union nuclear republics - particularly Belarus, Ukraine. The United States views observance of the NSG guidelines by these states as an important means of stemming the flow of nuclear materials and technologies. The NSG Guidelines include a number of important conditions that help promote nuclear cooperation under nonproliferation arrangements.

For Trigger List exports, the NSG Guidelines currently require:

- an agreement between the IAEA and the recipient country requiring the application of safeguards on all fissionable materials in its nuclear activities (so called "full-scope IAEA safeguards");
- physical protection against unauthorized use of transferred materials and facilities,
- restraint in the transfer of sensitive facilities, technology and related materials, i.e., exports that could facilitate to the acquisition of plutonium or highly enriched uranium.

**The Missile Technology Control Regime** was established in 1987. The aim of the regime is to limit nuclear weapons proliferation by controlling the export of missiles or unmanned aerial vehicles systems as well as equipment and technology for the development or production of such missiles. MTCR members do this by applying common export licensing measures to a list of sensitive items contained in the MTCR Equipment and Technology Annex. MTCR controls are not intended to hinder cooperation in civil space projects.

**The Hague Code of Conduct against Ballistic Missile Proliferation (HCOC)** was formally brought into effect on November 25, 2002, at a Launching Conference at The Hague, Netherlands. The HCOC is aimed at expanding efforts to decrease ballistic missile proliferation and to further full prohibition of such proliferation. The Code is a politically binding document focused on broad principles and unlike the MTCR its membership is not limited. It argues for greater restraint in the development, testing, use and spread of ballistic missiles. The Code is intended to support the Missile Technology Control Regime and is administered commonly by all of the subscribing countries.

At the G-8 Summit in 2002, Leaders, from the United States, United Kingdom, France, Germany, Italy, Japan, Russia, the European Union and Canada, launched the G-8 **Global Partnership Against the Spread of Weapons and Materials of Mass Destruction**. The eight countries agreed to spend 20 billion USD to support cooperation projects, initially in Russia. The Global Partnership is intended to address one of the most serious security threats by preventing terrorist groups from obtaining weapons and materials of mass destruction (WMD) to carry out their campaigns. The risk of WMD being used against people increased significantly after 1991 when Russia took possession from the states of the former Soviet Union of big quantities of nuclear, radiological, and chemical weapons and related materials. The four priority areas identified within the Global Partnership framework are:

- destruction of chemical weapons;
- dismantlement of nuclear submarines;
- nuclear and radiological security;
- employment of former weapons scientists.

**The Proliferation Security Initiative** was announced by U.S. President G. W. Bush in Cracow, Poland in 2004 - to respond to expand efforts of the international community to prevent the WMD proliferation through existing treaties and regimes. PSI participants cooperate to stop the flow of WMD and related materials and to prevent these items from being used by "states of concern" and non-state actors. The purpose of the PSI is to expand existing mechanisms and to create new tools to prevent the proliferation of WMD and missiles, consistent with national authorities, law enforcement services and related international law. PSI participants agreed "The Statement of Interdiction Principles" that is consistent with international law. The PSI is also consistent with the UN Security Council Resolution 1540 adopted in 2004, which underline the threat posed by the proliferation of WMD to international security and underline the need for UN member states to support nonproliferation initiatives.

**Paweł DURYS**

## **CBRN Crisis Management**

### **Introduction**

The international community recognises that security and development are linked. Insecurity, lawlessness, and violent conflicts are among the biggest obstacles to achieve of the international stability and peace. Poverty, underdevelopment and states of concern create fertile conditions for conflicts and the emergence of new security threats, including international crime and terrorism.

Complex crises demand a comprehensive response including a mixture of instruments and actors. In failed states, military instruments may be needed to restore order alongside humanitarian efforts to manage the immediate crisis. Civilian crisis management helps restore civil government. Chemical, biological, radiological, nuclear (CBRN) crises need both types of instruments. With their civil-military co-ordinated approach to crisis management the North Atlantic Treaty Organisation and European Union are particularly well equipped to respond to such multi-faceted situations.

### **Crisis and managing a crisis**

Crisis Management covers a broad range of issues. The first step is to agree on a common understanding of what crisis and crisis management mean. Only then we can identify the next issue – managing a crisis. There are a lot of definitions of crisis. We can define a crisis as “a national or international situation where there is a threat to priority values, interests or goals”. Crisis management is used here to mean “the ability to prevent, manage or resolve events, which may have the potential to damage your national interests through the exploitation of smooth and efficient inter-agency management procedures”.

All the actors with a role in managing a crisis need to be engaged from the earliest phases of crisis management planning. The first step is to perform an assessment of early warning signals and indicators that a crisis may be developing. If an action is considered to be appropriate, the next step is to establish a common understanding of the problem, from which the crisis management can be developed and agreed on, including a review method set in place to underpin it.

CBRN Crisis Management is a matter of how, at any given time during the development of a CBRN event, the best use of all available resources is made in terms of speed, staff, and co-ordination both within the national and international community.

It includes:

- Assessing the threat;
- Preventing an event;
- Protection against an event;
- Respond to an event;
- Recovering from an event.

### **NATO and Crisis Management**

NATO has adopted tools to cope with crises. They include e.g. political and military cooperation across Europe, new strategy and force structures, and more Partnership for Peace involvement. NATO recognises that there is a role in the field of Crisis Management for the Alliance, led by Senior Civil Emergency Planning Committee (SCEPC), to undertake such preparations. It needs to sustain its progress in addressing the risks posed by various crises but NATO efforts are not complete yet.

The crises are complex. The preparations and capabilities required to deal with these crises must be multi-faceted. The SCEPC is the appropriate NATO body to evaluate the range of issues posed by various crises. Comprehensive approach includes a system for coordination and planning. Appropriate NATO bodies develop some operational capabilities for consequence management related to CBRN events. Alliance can coordinate national responses, exchange information and lessons learned, and build on established emergency planning procedures.

Working together with Partners, NATO is actively involved in civil emergency planning for a CBRN attack on civilians. To this end, the Euro-Atlantic Disaster Response Co-ordination Centre (EADRCC) stands ready to act as a clearinghouse for assistance, upon request, to an Allied or Partner nation stricken by a major CBRN incident. Furthermore, a comprehensive Civil Emergency Planning Action Plan is implemented together with Partners. Central to this Action Plan, and the disaster response co-ordination capabilities of the EADRCC, is an inventory of weapons of mass destruction response capabilities. This inventory includes deployable units for CBRN consequence management and non-deployable forms of assistance, such as laboratory and hospital capacities. Other operationally oriented items in the Action Plan include border-crossing arrangements for relief teams, equipment and supplies, and a set of non-binding guidelines and minimum standards which nations could follow in the areas of equipment, training, and planning for CBRN crises response.

## **European Union and Crisis Management**

European Union Member States recognise the need to develop and improve existing EU planning and crisis response instruments. The aim is to achieve more integrated planning product, preferably based on early contingency planning, including identification of strategic options, taking into account contributions from all EU actors and recognising the need for interaction between political consultations and comprehensive planning. Comprehensive planning is defined as follows: "A systematic approach to planning, requiring the engagement of all appropriate bodies, to undertake the comprehensive analysis, development and delivery of a co-ordinated and coherent response to crisis. It includes identification of the interdependencies, priorities and sequence of activities, and thereby harness resources in an effective and efficient manner, through a comprehensive framework which permits review of progress to be made". Comprehensive planning is suitable for all types of possible EU-led operations involving more than one EU instrument, including fully integrated operations (civil-civil, civil-military). This planning approach is applicable to all crises, including CBRN crisis.

Early consideration and detailed understanding of the emerging crisis through a joint assessment sets the conditions for developing a coherent and comprehensive plan. In accordance with the Crisis Management Procedures the EU Situation Centre (SITCEN) collects information from various sources e.g. the Commission, Member States and agreed external channels. Steps are taken to analyse the problem from all angles, and to ensure coverage of all the issues affecting the crisis. The assessment process includes identifying the underlying causes and dynamics of the crisis as well as key actors.

Once a developing crisis has been identified, the joint assessment feeds into the discussion in the Political and Security Committee (PSC) which considers the extent of EU interest in the crisis, with advice from the European Union Military committee (EUMC) and Committee for Civilian Aspects of Crisis Management (CIVCOM) as appropriate. This assessment informs about both the conduct of a more detailed analysis and the development of the strategic plan, i.e. the Crisis Management Concept that should include the following:

- general endstate;
- key and interim objectives;
- delivery of key objectives;
- measuring success.

### **Civilian crisis management**

As we stated earlier, crisis management required civilian and military instruments. Civilian vulnerabilities to weapons of mass destruction influence the role of civilian crisis management and protection of populations. After the sarin nerve gas attack in Tokyo subway,

20 March 1995, the question before us is: how we can prepare ourselves for the next CBRN event? A good example is the Euro-Atlantic Disaster Response Coordination Centre (EADRCC) within the framework of NATO and Partnership for Peace. EADRCC coordinates the responses of EAPC countries to disasters occurring in the EAPC region. Within the EADRCC CBR Inventory was created, which comprises:

- Information on nations' pertinent capabilities which might be made available on a voluntary basis to protect the population and to reduce its vulnerability;
- The key types of capabilities which would be required for immediate response needs in case of CBR attack against civilian populations.

### **Military crisis management**

International community is still determined to develop military capabilities in the field of NBC defence, to prevent terrorism and the proliferation of weapons of mass destruction. They are also useful for CBRN crisis management. Thus a reason why NATO is still transforming its military capabilities and take lead to develop a deployable, usable and available Alliance NBC defence capability such a NATO Multinational CBRN Defence Battalion, which is compatible with NATO Response Force. The NATO Multinational CBRN Defence Battalion is designed to perform a full range of CBRN defence / protect missions are as follows:

- conduct deployment operations;
- prepare for command and control of all associated NBC defence units;
- prepare for NBC reconnaissance operations, including warning and reporting;
- provide all CBRN assessments and to advice NATO commanders at all levels.

In many cases the crises demand a serious response and specific, not only civilian, capabilities. There is a way that tools being developed for armed forces – for example, chemical and biological detectors – can be adapted for civil purposes. These capabilities could be used also to improve the ability of civil authorities to respond to CBRN event.

### **Conclusions**

Crisis management in the light of various crises plays crucial role in a modern world. We should perceived crisis management systems or procedures as a useful toolbox. It should be used flexibly and there is a need to tailor them to each specific case, for example in the case of CBRN attack on civilian population.

Generally, it is necessary that all crisis management systems have to be complementary with other actors (NATO, EU, and UN) or national decision-making procedures to fulfil there appropriate role. Both NATO and EU still enhanced their adopted tools to deal with crises, especially with CBRN accidents.

**Grzegorz CIELOCH**

## **THE CHARACTERISTICS AND EFFECTS OF NBC WEAPONS**

### **Aim of the presentation:**

- *to provide information about the characteristics and effects of nuclear, radiological, biological and chemical agents;*
- *to understand the threat posed by CBRN agents and describe how defence against all agents should be performed.*

According to the initial arrangement made during the last NBC NATO Standardization Agency (NBC NSA) meeting, the change of the definition of the CBRN weapons was considered. The new proposal of the definition is:

*CBRN Weapon - a fully engineered assembly designed for employment by the armed forces of a nation state to generate a nuclear detonation or to cause the release of a chemical or biological agent or radiological material onto a chosen target.*

### **Nuclear, radiological weapon**

There are many classifications of the nuclear detonations. Taking into consideration the height of the burst we can divide detonation into four basic types: high altitude bursts (exo-atmospheric), airbursts (endo-atmospheric), surface bursts, and sub-surface bursts (underground and underwater) or high altitude, air, ground (water), underground (underwater). In many ways nuclear and conventional (high explosive) explosions are similar. The difference is that conventional non-nuclear weapons do not produce destructive ionizing radiation. The release of energy from a nuclear explosion can be thousands or millions times more powerful than that of a conventional explosion. The enormous energy comes from the atoms break-up or fusion together. In fusion weapons, the original technology, the nuclei of elements at the heaviest end of periodic table are broken apart, releasing high-energy neutrons to bombard neighbouring nuclei. This reaction is initiated by the use of conventional explosives which cause two sub-critical masses of heavy elements (usually Uranium 235, plutonium 239 are used) to merge together. The critical mass is necessary for the release of massive amounts of energy. For example 1 kg of platinum can release energy equivalent to 10 kTs of conventional explosives. The world's first nuclear detonation was performed on 16 July 1945. The first military use was over the Japanese city of Hiroshima on 7 August 1945 and second occurred on 7 August 1954 over the city of Nagasaki. The yield of these detonation was between 10-20 kT.

The fusion weapons (hydrogen bomb) was developed later. This kind of weapon is much more energetic. The common nuclei are the hydrogen isotopes: deuterium and tritium.

The initial radiation products from the two types of weapons are different but the rest of effects are similar. The power of nuclear weapons is expressed in terms of the total energy released as compared with standard trinitrotoluene (TNT) explosion. Generally there are four main effects of detonation of the nuclear weapons:

- blast and shock;
- thermal;
- radiation;
- electromagnetic pulse.

One type of hazard that may influence military operations is a radiological hazard coming from nuclear waste disposal, deterioration of nuclear power facilities and damage of institutions that routinely use radioactive material. Additionally a new challenge has emerged in recent years. There is no problematic issue to possess radioactive materials. This type of material (often known as a dirty bomb) is under serious consideration by terrorists as a non-expensive weapons which can cause injuries and in some situations death. We do not use Cs 137, Co 60, I 131, Ir 192, Sr 90 for the construction of nuclear bomb but they can be used as a radioactive material to create casualties among people.

### **Biological agents/weapon**

#### ***Routes of entry***

- Respiratory Tract

BW agents suspended in the air can be inhaled. In humans the respiratory route is most vulnerable. An individual may become infected even when the concentration of BW agent in the atmosphere is very low. Many organisms that normally gain access to the body by routes other than inhalation can also produce infection of the respiratory route.

- Digestive Tract (Oral Route)

BW agents contained in food or water can be ingested, causing, for example: dysentery. The oral route, is considered to be suitable only for very small scale operations because the sterilization by boiling or chlorinating of water and the cooking of food will usually kill nearly all infecting organisms.

- Skin

BW agents can enter the body through the eyes or through the skin particularly through cuts and scratches (e.g.: tetanus) or insect bites (malaria, etc.). The deliberate use of the route is unlikely, however, as the desired effect cannot be assured. Some agents like toxins can cause illness or death by skin penetrating wounds.

#### **Classification of Biological agents**

Biological agents can be classified according to their biological type, uses, operational effects, and physiological action. For this reason we can divide the BA as a persistent and

non-persistent. The terms persistent and non-persistent describe the continuing hazard posed by the agent remaining in the environment. Taking into account the biological properties and an effect on the body we can classify the biological agents as pathogens and toxins.

### ***Pathogens***

Pathogens are disease-producing microorganisms, such as bacteria, rickettsia, fungi and viruses. Pathogens are either naturally occurring or altered by random mutation or recombinant deoxyribonucleic acid (DNA) techniques.

Pathogens are infectious agents that cause disease in man, animals, or plants. Agents that constitute antipersonnel biological warfare (BW) threats include bacteria, viruses, and rickettsias. While the vast majority of microorganisms are harmless or even helpful, there are about 100 naturally occurring pathogens that could be used as biological warfare (BW) agents. Pathogens cause disease (infection) by entering the body through the lungs, digestive tract, through the skin and mucous membranes of body openings. Once they enter the body, pathogens multiply, overcoming the body's natural defences, and produce disease. All bacteria do not require living cells for growth. Symptoms most commonly associated with pathogen infection include upper respiratory flu or cold like symptoms, vomiting, diarrhea, pneumonia or skin lesions (spots or rashes). Some pathogens, cause nervous systems damage (headache, paralysis, convulsions, or coma).

### ***Bacteria***

Bacteria are living microorganisms. Unlike viruses and rickettsias, they are capable of reproduction outside living cells. If they enter the body and if the victim is not properly treated, the microorganism will multiply and incapacitate the host. Bacteria can be found in almost any environment. Those few that are potential BW agents have the ability to rapidly cause illness after entering the body through the lungs or digestive tract. A typical bacterial cell is 1-2 microns in diameter and 2-10 microns in length. Many have the ability to form spores, which are "resting" forms of the bacteria that are highly stable under the conditions of aerosolization. The diseases caused by bacteria are often treatable with antibiotic therapy.

### ***Viruses***

Viruses constitute a large group of infectious organisms. Unlike bacteria, they must be inside a cell in order to multiply. Viruses multiply by taking over the cell, causing it to produce viruses instead of normal cell components. After producing hundreds or even thousands of virus particles, the cell is often destroyed as these particles are released. Viruses are much smaller than bacteria, ranging from 0.02 - 0.2 microns in size. Their small size means that a relatively small amount of agent can infect a large number of personnel across a wide area.

### ***Rickettsiae***

Rickettsiae have characteristics common to both bacteria and viruses. Like bacteria, they possess metabolic enzymes and cell membranes, use oxygen, are capable of forming highly resistant spores, and are susceptible to broad-spectrum antibiotics. They resemble viruses in that they grow only within living cells. Rickettsiae are bacteria that are unable to multiply

unless they are within a living cell. Most are spread from one person to another by means of an insect or tick that serves as a vector. The rickettsia will be picked up by the vector from one infected person or animal, which then transmits the rickettsia when it bites its next victim. Rickettsiae are smaller than most bacteria, but larger than viruses.

### ***Fungi***

Fungi are independently reproducing organisms, many of which are highly capable of sporulation. They do not normally cause lethal disease in healthy humans but are very effective anti-agricultural and anti-crop toxin agents.

### ***Toxins***

Toxins are poisons naturally produced through the metabolic activities of living organisms. They are organic chemical compounds, such as proteins, polypeptides, and alkaloids, that come from a variety of biological sources. Some toxins can be chemically synthesized, and some can be artificially produced with genetic engineering techniques. Laboratories can synthesize toxins composed of only 10 to 12 amino acids. Toxins exert their lethal or incapacitating effects by interfering with certain cell and tissue functions. Although toxins were initially isolated from living organic sources, manufacture of some by chemical synthesis or other biochemical processes is feasible. Industrial fermentation processes can obtain large amounts of highly concentrated bacterial toxins. Basically, there are toxins that disrupt nerve impulses (neurotoxins) and toxins that destroy cells by disrupting cell respiration and metabolism (cytotoxins). There is a vast range of signs and symptoms with both toxin types. These signs and symptoms can be confused with both chemical and pathogen poisoning. The neurotoxins tend to be quick acting and produce nerve agent-like symptoms in seconds to hours. Symptoms of neurotoxin poisoning range from mental confusion, loss of balance to death. An example of a neurotoxin is palytoxin. This is a fast acting toxin causing muscle paralysis then death within 5 minutes. Cytotoxins tend to be slower acting and produce choking, blistering, or even radiation-like symptoms in a period of hours to days. Symptoms range from skin lesions such as blisters, to vomiting, diarrhea, coughing, and choking (the latter three signs may be accompanied by bloody discharges) to marked weakness, coma, and death.

### **Protection measures**

Protection against biological requires intelligence, effective protection and decontamination procedures, and well-trained, properly equipped forces. Preparations before an attack can be accomplished long before a biological attack happens. Personal health maintenance and realistic training are just a few ways in which the commander can minimize his biological casualties. All soldiers and leaders must adhere to the basic principles of good health. This applies especially under NBC conditions. Soldiers must continually follow these basic principles such as up-to-date immunizations, good hygiene, area sanitation and physical conditioning so unit efficiency will not suffer severe degradation. Immunizations reduce the

chances of soldiers becoming biological casualties. Many diseases uncommon in the United States such as cholera and plague are prevalent in other parts of the world. Proper immunizations protect against many known disease-producing biological agents. All soldiers should receive basic immunizations. Medical personnel periodically screen these records and keep them up to date. If soldiers or units deploy to areas in which specific diseases are prevalent, readiness preparation may include receiving additional immunizations for needed protection. Medical and technical intelligence can also furnish information to support assessments. Recommendations may be finished on needed precautions and/or medications that are needed prior to deployment.

Contamination avoidance is essential to reduce the impact of biological hazards. Our ability to survive, fight, and win on a biologically contaminated battlefield, requires the capability for warning and detecting an attack and identifying the agent. Detecting biological agent attacks is not easy. Future developmental items may include the ability to detect biological agents with using mass-spectrometer. For those agents that cannot be identified, detection is accomplished by recognizing a pattern of employment to predict an attack. Recognizing the signatory symptoms, and effects of biological agents. Sampling with air samplers may provide indication of an attack in progress. The first two methods of detection are the only methods we have of warning troops of an attack before it occurs. The last method will alert the unit that an attack has occurred, and therefore allow the unit to take necessary protection and decon procedures to minimize the effects. Additionally, this method will help to establish a pattern of employment and, during future attacks, it will give notice (or at least high suspicion) that the enemy is employing biological agents. At this point, it should be added that when a unit is attacked, the unit can only suspect a biological attack. This suspicion is based on dissemination techniques, patterns of employment and the "window of vulnerability". The confirmation of a biological attack occurs only when a sample of the unknown agent is obtained and laboratory analysis confirms the substance. Prior to this laboratory confirmation, the unit will not know if the attack was biological or chemical from an unknown source. Mission Oriented Protective Posture (MOPP) will protect the wearer against all known chemical or biological agents. Therefore, the unit must assume MOPP full protection.

### **Chemical agents**

Chemical agents may be classified as a persistent and non-persistent. This classification is based on the chemical properties of agents. Persistent agents are used to contaminate the terrain or materiel. This agents can produce casualties (immediate or delayed). Immediate casualties occur when the soldier inhales the vapour. Delayed casualties occur and is absorbed through the skin demonstrating the need for protective equipment. The persistency may lost even for several days (it depends on the type of agents and weather conditions). Generally, it

is considered that non-persistent agents are used to create favourable fighting conditions, produce casualties prior to an assault, for forcing troops into a higher MOPP level.

We can classify chemical agents according to their effect on the body. There are several major types of agents:

- nerve;
- blister;
- blood;
- choking;
- tearing;
- vomiting;
- irritating.

### ***Nerve agents***

Nerve agents because of their high toxicity are considered as the most dangerous agents.

All substances are very effective through multiple routes of entry. This type agent is considered as rapid acting agents. Nerve agents can be divided into two types: G-series agents and V-series agents. The G-series agents include GA (tabun), GB (sarin), GD (soman), and GF. G-agents are generally non-persistent unless they are thickened with various other substances. The V-series agents include VE, VG, GM, VS, and VX; they tend to be more toxic than the G-agents and are relatively persistent (the persistency especially depends on weather conditions).

Nerve agents are able to inhibit an acetylcholinesterase. This enzyme is responsible for transmitting nerve impulses. Even small quantities are extremely toxic and finally can cause death in less than 15 minutes if not treated. Symptoms start with the small running nose and if not treated finish with death.

A very important issue is that there is the possibility to produce and use nerve agents by terrorist groups.

### ***Blister agents***

They are used primarily to cause medical casualties, to force opposing troops to wear full protective equipment, to restrict the use of terrain, to slow movement, and to hamper the use of materiel and installations. Although agents are not used primarily to kill, exposure to these agents can be fatal.

### ***Blood agents***

These agents are absorbed into the body by breathing. They prevent cells from using oxygen normally and cause damage to body tissues. They are highly volatile and are most effective when the element of surprise can be achieved against troops that do not have masks or are poorly trained in mask discipline. Because blood agents degrade a mask filter's capabilities,

they are useful in defeating the mask's protective capabilities when combined with other agents.

### ***Choking agents***

Choking agents, known as first-generation agents, are the oldest CW agents. Effects of using these agents are shortness of breath, coughing. In sufficient concentrations, choking agents have a corrosive effect on the respiratory system that results in a build-up of fluid in the lungs (pulmonary edema).

### ***Incapacitating agents***

Incapacitating agents produce temporary disabling conditions that persist for hours to days after exposure to the agent. Medical treatment, while not essential, may facilitate more rapid recovery. Incapacitating agents fall into two categories: central nervous system (CNS) depressants (anticholinergics) and CNS stimulants (LSD). Relatively high doses of CNS depressants produce toxic delirium, which impairs the ability to perform any military task.

### ***Tearing agents***

A riot control agent, is characterized by a very low toxicity (chronic or acute) and a short duration of action. Effects of using these agents are burning, stinging of eyes, nose, airways, skin. In situations of massive exposure, if the tear gas is swallowed, it can cause vomiting.

### ***Vomiting agents***

Generally speaking, this kind of agents cause great discomfort. Arsenic-based vomiting agents produce a strong pepper-like irritation in the upper respiratory tract, with irritation and tearing of the eyes. They cause violent, uncontrollable sneezing, coughing, nausea, vomiting, and a general feeling of bodily discomfort. The action of vomiting agents makes it impossible to either put on or continue wearing a protective mask. In military situations, vomiting agents may be used in conjunction with other lethal chemical warfare agents to cause troops to remove their masks to vomit, exposing them to other, more lethal agents.

## **Protection measures**

Protection against chemical agents requires to apply the same rules like against biological warfare agents. There is the need to understand the physical characteristics, employment and weather and terrain conditions. Units can then estimate when and where specific type of chemical agents will be used, where the hazards are, and how best to avoid them. There is the need to organize and perform as much as possible of exercises with not-real agents. It allows to be a very good prepared against effects of chemical agents. All undertakings for adequate protection should include detection, identification, W&R and decontamination procedures.

The basic threat principle is to use chemical agents on unprotected troops to create casualties. Against protected troops, the primary purpose is to make the use of equipment, terrain, and operations more difficult.

Is considered that the use of chemical weapons by the threat forces initially may require a decision at the same level as nuclear weapons. Threat forces should consider chemical weapons as an extension of conventional warfare.

Finally, there is the necessity to say that if personnel understand the way of using chemical agents, they will be better able to avoid chemical hazards.

To conclude my presentation, I would like to mention the threat coming from CBRN agents. So far we have considered that nuclear weapon causes relatively the most dangerous threat for the personnel and materials. Nowadays we have changed the understanding of the possibility of using this kind of weapon during the crisis/war. Taking into account capabilities for production - especially the price of weapons – we can say that biological agents should be considered as the most dangerous type of the weapon of mass destruction.

**Marcin KLOSKE**

## **THE NBC DETECTION, IDENTIFICATION & MONITORING**

We should remember that nowadays the NBC detection, identification & monitoring is the analytical chemistry area of interests. NBC is an abbreviation used to indicate nuclear, biological and chemical weapons, warfare, or defences against them. It superseded the term "ABC weapons", where the A refers to atomic. NBC is the term used by NATO armed forces, however, in popular civilian parlance the term Weapons of Mass Destruction (WMD) is now more commonly used. The NBC Warning and Reporting System in the Polish Armed Forces has been subject to continues enhancements. The present NATO requirements cause the need to carry out several measures in different fields. The NBC reconnaissance equipment has to be replaced and gradually the new generation of NBC recon equipment is procured into the Polish Armed forces. I should remind you that weapons of mass destruction (WMD) generally include nuclear, biological, chemical and, increasingly, radiological weapons. The term first arose in 1937 in reference to the mass destruction of Guernica, Spain, by aerial bombardment. Following the bombing of Hiroshima and Nagasaki, and progressing through the Cold War, the term came to refer more to non-conventional weapons. The terms ABC, NBC, and CBRN have been used synonymously with WMD, although nuclear weapons have the greatest capacity to cause mass destruction. The phrase entered popular usage in relation to the U.S.-led multinational forces' 2003 invasion of Iraq. Because of their indiscriminate impacts, fear of WMD has shaped political policies and campaigns, fostered social movements, and has been the central theme of many films. Support for different levels of WMD development and control varies nationally and internationally. Yet understanding of the nature of the threats is not high, in part because of imprecise usage of the term by politicians and the media. Selected elements of the NBC W&RS take part in NATO trainings and exercises improving their operational capabilities. In Polish science institutes research is conducted to develop more advanced NBC detection systems. these systems will be able to automatically transfer reports from recon. Additionally, the new computer NBC hazard assessment procedures are developed. At present existing computer software meeting NATO standards are implemented into NBC Zone Control Centre. For hazard assessment purposes, the weather is necessary information, which should be ensured from military and civilian meteorological services. To fulfil all the NATO commitments and requirements there are several objectives to be accomplished. All NBC reconnaissance units will be provided with equipment enabling prompt detection of radiological, biological and chemical agents. An appropriate liaison means will be established to ensure timely and automatically passing all NBC messages between units being in concern. Each battalion is gradually equipped with NBC recon post having automated system of detection and passing data from detection. There

are at present several computer systems designated to support decision making process, which are implemented into commands. The software enables data base storage, hazard assessment, NBC data transfer and evaluation. Among them are HPAC and NBC RPM (USA), NBC Analysis (Denmark) and some Polish systems. In accordance with Prague Commitment Capabilities (PCC) an operational readiness of NBC Mobile Laboratory and NBC Joint Assessment Team will be achieved. Some agreements will be sorted out to ensure continuous flow of appropriate valid weather information to all units being in concern, exploiting command chain, additionally retrieving data from civilian resources.

Radioactive contamination is a special form of environmental pollution. It occurs when highly active radioisotopes are released into the environment. An example of radioactive contamination is the Chernobyl explosion in the USSR. Some people think that radioactive waste could be released into the environment. Radioactive contamination is typically the result of a loss of control of radioactive materials during the production or use of radioisotopes. For example, if a radioisotope used in medical imaging is accidentally spilled, the material could be spread by people as they walk around. Radioactive contamination may also be an inevitable result of certain processes, such as the release of radioactive xenon in nuclear fuel reprocessing. In cases that radioactive material cannot be contained, it may be diluted to safe concentrations. Nuclear fallout is the distribution of radioactive contamination by a nuclear explosion. Containment is what differentiates radioactive material from radioactive contamination. Therefore, radioactive material in sealed and designated containers is not properly referred to as contamination, although the units of measurement might be the same. Surface contamination is usually expressed in units of radioactivity per unit of area. For SI, this is becquerels per square meter (or Bq/m<sup>2</sup>). Other units such as picoCuries per 100 cm<sup>2</sup> or disintegrations per minute per square centimetre (1 dpm/cm<sup>2</sup> = 166 2/3 Bq/m<sup>2</sup>) may be used. Surface contamination may either be fixed or removable. In case of fixed contamination, the radioactive material cannot by definition be spread, but it is still measurable.

Biological warfare, also known as germ warfare, is the use of any organism (bacteria, virus or other disease-causing organism) or toxin found in nature, as a weapon of war. It is meant to incapacitate or kill an adversary. It may also be defined as the employment of biological agents to produce casualties in man or animals and damage to plants or material, or defence against such employment. The creation and stockpiling of biological weapons is outlawed by the 1972 Biological Weapons Convention, signed by over 100 countries, because a successful attack could conceivably result in thousands, possibly even millions of deaths and could cause severe disruptions to societies and economies. Thus, a robust surveillance system involving human clinicians and veterinarians may identify a bioweapons attack early in the course of an epidemic, permitting the prophylaxis of disease in the vast majority of people (and/or animals) exposed but not yet ill. For example, in the case of anthrax, it is likely that by 24 -36 hours after an attack, some small percentage of individuals

(those with compromised immune system or who had received a large dose of the organism due to proximity to the release point) will become ill with classical symptoms and signs (including a virtually unique chest X-ray finding, often recognized by public health officials when they receive timely reports). By making this data available to local public health officials in real-time, most models of anthrax epidemics indicate that more than 80% of an exposed population can receive antibiotic treatment before becoming symptomatic, and thus avoiding the high mortality of the disease.

Chemical warfare is warfare (and associated military operations) using the toxic properties of chemical substances to kill, injure or incapacitate an enemy. Chemical warfare is different from the use of conventional weapons or nuclear weapons because the destructive effects of chemical weapons are not primarily due to any explosive force. The offensive use of living organisms (such as anthrax) is considered to be biological warfare rather than chemical warfare; the use of nonliving toxic products produced by living organisms (e.g., toxins such as botulinum toxin, ricin, or saxitoxin) is considered chemical warfare under the provisions of the Chemical Weapons Convention. Under this Convention, any toxic chemical, regardless of its origin, is considered a chemical weapon unless it is used for purposes that are not prohibited (an important legal definition, known as the General Purpose Criterion). About 70 different chemicals have been used or stockpiled as Chemical Weapons (CW) agents during the 20th century. Chemical weapons are classified as weapons of mass destruction by the United Nations, and their production and stockpiling were outlawed by the Chemical Weapons Convention of 1993. Under the Convention, chemicals that are toxic enough to be used as chemical weapons, or may be used to manufacture such chemicals, are divided into three groups according to their purpose and treatment:

Schedule 1 – Have few, if any, legitimate uses. These may only be produced or used for research, medical, pharmaceutical or protective purposes (mustard gas, lewisite).

Schedule 2 – Have no large-scale industrial uses, but may have legitimate small-scale uses (dimethyl methylphosphonate, a precursor to sarin).

Schedule 3 – Have legitimate industrial uses (phosgene, chloropicrin).

Spectroscopy is the study of spectra, that is, the dependence of physical quantities on frequency. Spectroscopy is often used in physical and analytical chemistry for the identification of substances, through the spectrum emitted or absorbed. A device for recording a spectrum is a spectrometer. Spectroscopy can be classified according to the physical quantity which is measured or calculated or the measurement process. Spectroscopy is also heavily used in astronomy. Most large telescopes have spectrographs, which are used either to measure the chemical composition and physical properties of astronomical objects or to measure their velocities from the Doppler shift of spectral lines. The type of spectroscopy depends on the physical quantity measured. Normally, the quantity that is measured is an amount or intensity of something.

The intensity of emitted electromagnetic radiation and the amount of absorbed electromagnetic radiation are studied by electromagnetic spectroscopy.

The amplitude of macroscopic vibrations is studied by acoustic spectroscopy and dynamic mechanical spectroscopy.

Kinetic energy of particles is studied by electron energy loss spectroscopy and Auger electron spectroscopy.

The mass-to-charge ratios of molecules and atoms are studied in mass spectrometry. A mass spectrometer does not measure the kinetic energy of particles - all particles have the same known kinetic energy (or an integer multiple thereof, depending on the charge) - so it is disputable whether this field strictly is a type of spectroscopy.

The number of molecules or atoms or quantum-mechanical states to which the frequency or energy parameter applies. In this case the spectrum is usually called cross section.

A mass spectrum is an intensity vs. mass-to-charge plot representing a chemical analysis. Hence, the mass spectrum of a sample is a pattern representing the distribution of components (atoms or molecules) by mass (more correctly: mass-to-charge) in a sample. It is usually acquired using an instrument called a mass spectrometer. Not all mass spectra are the same. For example some mass spectrometers break the analyte molecules into fragments; others observe the intact molecular masses with little fragmentation. A mass spectrum can represent many different types of information based on the type of mass spectrometer and the specific experiment applied; however, all plots of intensity vs. mass-to-charge are referred to a mass spectra. Mass spectrometry is an analytical technique used to measure the mass-to-charge ratio ( $m/z$ ) of ions. It is most generally used to find the composition of a physical sample by generating a mass spectrum representing the masses of sample components. The technique has several applications, including:

- identifying unknown compounds by the mass of the compound and/or fragments thereof;
- determining the isotopic composition of one or more elements in a compound;
- determining the structure of compounds by observing the fragmentation of the compound;
- quantitating the amount of a compound in a sample using carefully designed methods (mass spectrometry is not inherently quantitative);
- studying the fundamentals of gas phase ion chemistry (the chemistry of ions and neutrals in vacuum);
- determining other physical, chemical or even biological properties of compounds with a variety of other approaches.

Pollutants are substances which directly or indirectly damage us or the environment. Many of the compounds which are dangerous to the environment can also be harmful to us in the long-term and come from mineral and fossil sources, like petroleum. Pollutants can cause

the destruction of areas of the environment which are protective to us. CFCs were carefully chosen not to be damaging to humans, but a side effect causes an effect held to be very damaging to the environment. They diffuse into the upper atmosphere where they stay for some time. When the sun's radiation does break them down, they turn into highly-reactive radicals. These catalyse the break down of the ozone layer, which protects us from cancer-causing ultraviolet radiation from the sun. CFCs are especially damaging because one CFC molecule can cause the breakdown of many millions of ozone molecules. Applications of IR Fourier transform Infrared Spectroscopy (FTIR) spectroscopy is a measurement technique for collecting infrared spectra. Instead of recording the amount of energy absorbed when the frequency of the infra-red light is varied (monochromator), the IR light is guided through an interferometer. After passing the sample the measured signal is the interferogram. Performing a mathematical Fourier Transform on this signal results in a spectrum identical to that from conventional (dispersive) infrared spectroscopy. FTIR spectrometers are cheaper than conventional spectrometers because building of interferometers is easier than the fabrication of a monochromator. In addition, measurement of a single spectrum is faster for the FTIR technique because the information of all frequencies is collected simultaneously. This allows multiple samples to be collected and averaged together resulting in an improvement in sensitivity. Because of its various advantages, virtually all modern infrared spectrometers are of the FTIR variety.

Neutron activation is the process in which neutron radiation induces radioactivity in materials, and occurs when nuclei capture free neutrons, becoming heavier and entering excited states. Such nuclei are frequently radioactive, sometimes with very short half-lives, so they and their decay products generally make the material radioactive. Thus, unlike alpha, beta, and gamma radiation, neutron radiation leaves the exposed materials emitting their own radiation long after exposure. In places with high neutron fluxes (primarily the cores of nuclear reactors) neutron activation contributes to material erosion, and the materials themselves must be disposed of as low-level radioactive waste. Some materials are more subject to neutron activation than others, so a suitably chosen low-activation material can significantly reduce these problems. One way to demonstrate that nuclear fusion is occurring inside a Farnsworth-Hirsch fusor is to use a Geiger counter to measure the radioactivity induced in a sheet of aluminium foil. The lasting radiation from a nuclear weapon is in large part due to the neutron activation of the bomb itself and the surrounding material.

## **Physical Protection**

### **Respiratory protection – individual**

Protection of the respiratory tract and eyes is of primary significance, since penetration of toxic substances through the respiratory system, generally poses the greatest danger. This protection is accomplished with a protective properly fitted gas mask and filter canister. The main feature of this mask is the NBC-protection filter, consisting of an aerosol filter (fibreglass paper) and an adsorption-based gas filter – fixed bed of activated, impregnated carbon. The inhaled air is filtered, retaining harmful materials. A properly-fitting protection mask with filter has an elimination factor of over 10,000 which means a maximum of one out of ten thousand micro-particles can penetrate the filter or concentration of gaseous substances is reduced in the same way. Thus, the gas concentration is reduced by a factor of ten thousand. This applies to all relevant harmful gaseous substances and aerosols, with the exception of carbon monoxide and nitrogen oxides. Thus, reliable protection is guaranteed. Protection against B-agents (viruses, bacteria, spores) is also guaranteed. The few B-agents, which are mobile, are found on the border layer of the impregnated active carbon (chromium, copper and silver salts) under inhibitory growth conditions, so that a "grow through" of viruses, bacteria, and spores into the filter media is not expected, but it is very difficult to measure a growth of bacteria or viruses on porous material such as activated carbon.

### **Skin and body protection**

Some C-weapons can also penetrate through the skin. As protective material, permeable NBC protective suits are available in Poland, as well as impermeable NBC-gloves and NBC-boots. This combination offers sufficient protection against radioactive dust (N) and harmful gaseous substances (C). In case of radioactive dust there is no or weak protection against radiation. Two main types of suits are in use in large quantity in the armed forces. The heavy isolation suit – is designed for a special purpose. Soldiers from decontamination troops and teams must have special equipment which allows them to work for a long time in a dangerous environment. This suit is equipped with blowing units with special filters for ventilating inside space. This techniques allows avoiding heat stress and for better water vapour removing.

The light weight isolation suit is a part of each soldier is individual equipment. It was designed for the Land Forces, Navy, flying personnel, ground technical personnel. With the protective gas mask it is for skin and body protection against CWA and TIM's. This suit

could be used by other military and civilian units – for other tasks and places. It consists of a tunic with a hood, trousers with boots and gloves.

## **COLPRO**

Collective protection facilities – buildings, vehicles, tents are designed for keeping toxic free environment inside them. In ideal conditions the overpressure inside those structures is generated by air filtration unit – which can protect against all types of contamination - and in this way clean air is delivered to people. This system allows working without IPE for unlimited period of time.

There are different types of Air Filtration Unit (AFU) for different types of protected objects:

- AFU UFWCz-200 for tank crew protection, two filters FPT-100M each 100 m<sup>3</sup>/h can clean air from air born aerosol with diameter above 0,3 micrometer, and from CWA in form of gases and vapours, in limited level protection against TIM's.
- AFU for a small container and vehicle cabin. One FPT-200M with air flow and overpressure regulation is sufficient for up to 10 soldiers. It is possible to achieve 500 Pascals overpressure.
- UFW-900-2C for tent COLPRO system with air flow 2x 900 m<sup>3</sup>/h. It is used for protection up to 20 working, or for 40 resting people.

## THE POLISH MILITARY NBC WARNING AND REPORTING SYSTEM

### INTRODUCTION

#### A system and its structure as well as classification

A feature of all systems is their incorporation and coherency acting by internal connection among specific components. Just two or more numbers of elements connected with each other related dependency are treated as a system. The structure is one visible and a materially built faces of all systems. The relations among elements belong to a higher characteristic value. The relation among the elements of the system can be reflexively or directly established. The reflexive connection is defined as both side relations and consequently, a directed connection is one side (way) relation, Fig. 1 and 2.

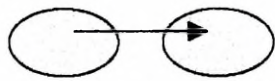


Fig. 1. One way relation

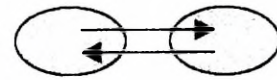


Fig. 2. A reflexive connection

There are a lot of systems typologies. We will discuss one of them. Systems can occur as simple or aggregated. The type is simply a transition of size and number of relations. If a number of elements is slightly small we are dealing with the simple, flat layered system or even subsystem. If a number of elements is huge is appeared spaced body, which is defined as an aggregated system. It could be easy to identify. The simple systems can be created as a point or linear structures. The aggregated system creates (it looks like) as lamp body.



Fig. 3. The pointed system (an example)



Fig. 4. The linear system (an example)

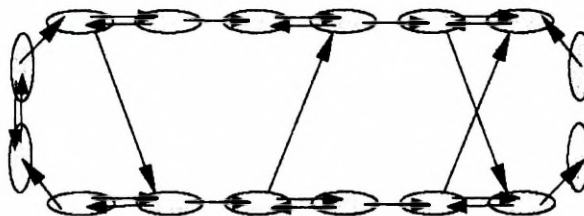


Fig. 5. The aggregated system (an example)

Going to the relations existing inside a system it can be rated to the system of first, second or third row. The first row system displays two or more elements connected linearly one by one but one element can connect either to one or up to two elements (point or linear system). In the systems of the second row one element has to be connected with at least three or more elements but among connected elements does not exist a directly created dependency. The third row system consists of at least one central element connected with three or more other elements and these elements through other elements can touch these central elements (an aggregated system). In connection with both features the structure and organization it should be explained that each part of an aggregated system, which can operate individually without significant support from other parts of any system or subsystem, is defined as a chain of the system. A role of the system's chains is important because its efficiency provides live work of a whole system.

## **2. An emerging need to launch NBC Warning and Reporting System**

A system that is going to be discussed during this lecture belongs to a group of information systems. It means that the main product of operation of that system is in wide understanding of an area of information. Each piece of information utilizes by a Chemical, Biological Radiological and Nuclear Warning and Reporting System (NBC W&RS) can have crucial meaning for the survivability of human being. Everyone NBC W&RS in dependency on a manager (usually owner) is strictly counted to either no military or military system. The military system is conditionally launched to provide maximum level of security to troops in a NBC contaminated environment. Historically assessing the operations conducted by military troops after using the first mass destruction weapon was impacted to discover an obvious need to create such a system. During WWII a prototype system was known as the gas-warfare service, which role was to detect some known gas agents and fumes that had posed danger to troops. After the occurrence of an invention of real NBC agents the role of military (but not only) NBC W&R S was getting more seriously because of its importance at force protection. A vast NBC data flown and collected from a battlefield as well data got from non-military resources have to be transformed to utilizable information This task is being entrusted to the subject of this lecture. A common role of NBC W&R S in the armed forces is to collect NBC data, transform and disseminate these data as reason to undertake task of force protection, to decision making by staffs and commanders on countermeasures use to relief possible results of effects from utilized by adversary NBC agents. Contemporarily NBC W&R Systems in general view exist in the Polish Armed Forces consisting of three main components (Fig.6.):

- sources of information;
- transmission lines;
- NBC Collection Centres.

## POLISH (MILITARY) NBC WARNING AND REPORTING SYSTEM

### 1. Basic responsibilities

The Polish military NBC W&R System was established in its present form by PI MOD, with decision no 248/MON, dated on 21.12.2000 and later updated on decision 348/MON dated on 12.12.2002. This modified decision expresses responsibility of the military authority as well the present structure and consistency of this system. The chief of Combat Support Directorate in Polish General Staff is responsible for the organisation and equipment of PI W&R System there. The chief of the NBC Defence Directorate in the Polish General Staff is responsible for the expert's supervision over PI W&R System.

### 2. Tasks

PI NBC W&R System's tasks were divided into 3 elements. First – sources of NBC information, second NBC laboratories as well as the sources of NBC information, and finally NBC Collection Centres (Fig.6.).

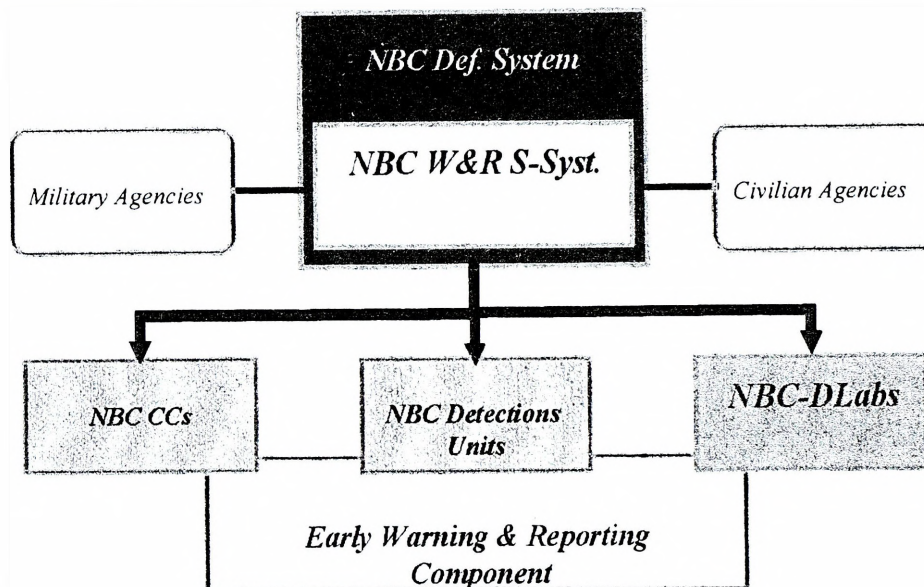


Fig. 6. NBC W&R System, as well the Early W&R System in a general view

The sources of information are military units tasked with detection and monitoring of NBC hazard. Detailed responsibilities are as follow:

- determination of chemical and nuclear warfare parameters;
- surveillance, monitoring of NBC contamination and contaminated areas marking;
- NBC sampling from contaminated environment and specify for level of contamination;
- measurement of atmospheric conditions and conveying these data to NBC Collection Centres (CollC);

- transmission of getting NBC bursts and contamination data to NBC CollC;
- NBC warning and alarming properly to the AOR.

NBC Analytical (Deployable) Laboratories (incorporated into sources of NBC detection) provide:

- Collection of NBC samples taken by designated military units;
- expert NBC analysis;
- running sampling teams and use of sampling procedure processes;
- transmission of NBC analytical data to NBC CollC.

NBC Collections Centres as well NBC Area Control Centre have been designed to operate with the following matters:

- coordination of W&R activity in chains of the entire PI W&R System;
- receiving NBC reports from proper sources;
- transfer of NBC reports to superior, subordinate or cooperating NBC CollC as well to paramilitary and allied chains of W&R System or similar agencies:
  - NBC data basis maintenance;
  - drawing up forecasts and assessments of result NBC events as well giving expert advice to commanders (staffs) in order to assist in the decision making process on relief to by NBC agents affected troops and areas;
  - NBC warning and alarming of NBC affected units operating in AOR determined to concrete NBC W&R CollC;
  - study of plans for development and action of individual NBC W&R System chains;
  - heading of exercises with subordinated NBC W&R System chains.

### **3. Structure**

The head of PI NBC W&R System is NBC Area Control Centre that is supervising over NBC Control Centres being located in the Polish Air Forces, Navy and Army (Fig.7). The Air Component of NBC W&R System consists of CollC (Air) BDE level and Air Command Centres. Similarly, the Polish Navy consists of level of CollC (N)BDE as well as Navy Fleets. The most developed structure is laid on two main components. It means an operational and territorial elements of that.

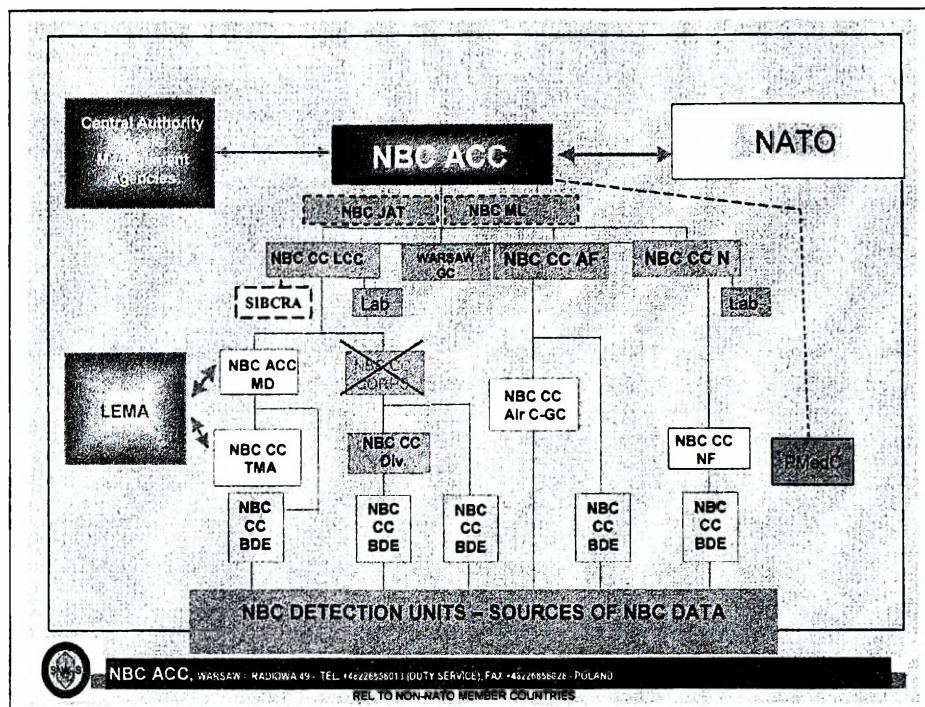


Fig. 7. The whole structure of the PI NBC W&R System and its inside set up links

The operational component consists of corps (just temporarily due to transformation PI AF), division and brigade levels. The territorial part covers home defence brigades as well as a territorial representative of military authority.

Territorially tasked NBC CC are defined as the zone NBC CC.

Below level of BDE CollC there are sources of NBC data, it means especially designated units to detect and pass valuable information from NBC detectors. The NBC CC on the BDE level are defined either as sub-collection or units centres.

In the peace time only especially dedicated part of the whole system is operating. This solution is conditionally forced by economical reason to keep such huge strength of forces as it is reasonably needed. Therefore, in the highest readiness there are kept: a properly defined pool of the military sources of information (mainly standing detection posts, NBC recee teams as well as automatic radiac emergency net), NBC laboratories and NBC CollC (NBC ACC as well).

This component is defined as the NBC Early W&R System.

The area of occupation and responsibility in the above mentioned elements created NBC Early W&R (Sub)system. Sub because of a component of the NBC W&R System.

#### 4. Cooperation

The military NBC W&R System is an active working body whose interest area is spread as well as to no-military NBC. The highest level of the mentioned cooperation is established on the level of national ministries. As NBC ACC strictly conducts an informational cooperation

with the Ministry of Interior Affairs (superior of fire brigade, border guard and obviously territorial administration as well), the Ministry of the Environment (especially National Nuclear Agency and Laboratory, Meteorology Institute). This organizational level of the system keeps (via NBC ACC) duty communication lines to point of switch the Polish system to NATO NBC W&R net.

Going down to territorially located chains of system area of interest is spread gradually to equivalent agencies which are located either in AOR or near that.

### 5. NBC Reporting

The NBC Reporting consistent to NBC warning and alarming is an essential part of the statutory activity performed by PI NBC W&R. A common language uses by the system are NBC reports, that have created in accordance to NATO procedure ATP 45. The behaviour of each part of the system depends on the specification of an NBC event. The keynote is to optimal this whole process to gain as much as possible advantages of time which is a crucial object, it lets NBC defenders undertake the proper NBC countermeasures. The growing potential of industrial making NBC hazard has forced to address main interest of NBC W&R System to get sensibilities against TIC due to the NBC W&R System chains by using territorially located military agencies to excellent own abilities to speed of processes and transmission of data.

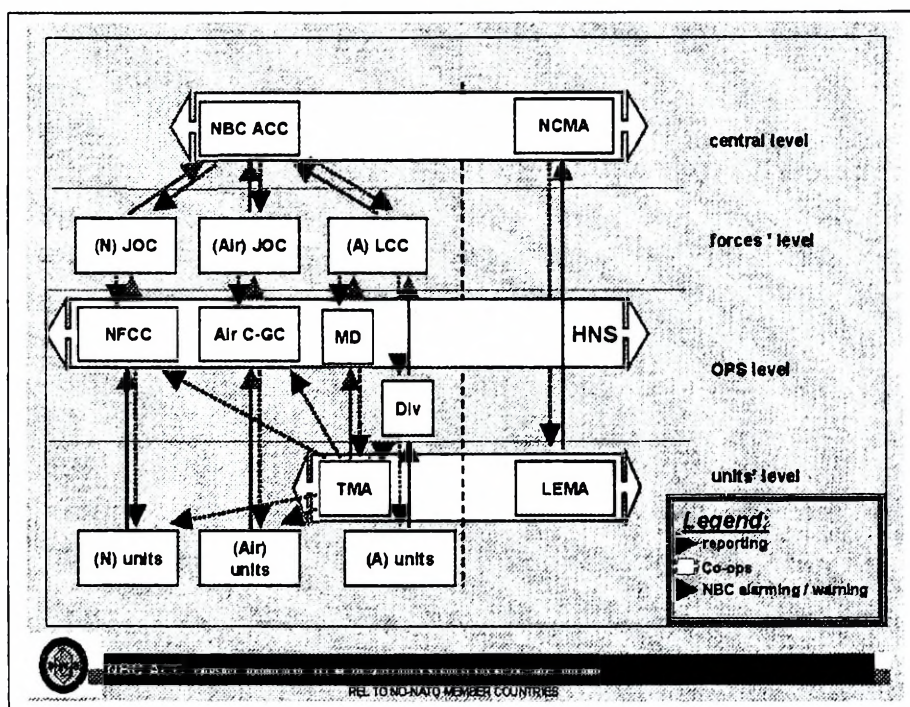


Fig. 8. NBC reporting ways in the PI W&R System

## 6. Training and excellence of NBC W&R System

In order to reach on acceptable level of efficiency on our NBC W&R chains of system, especially personnel takes part in a training process. It covers abroad area of professional needs. In the phase of preparation a game of seminars and workshops are included. This phase consists as well a ground education done in frame of the programme excellencies have provided by units.

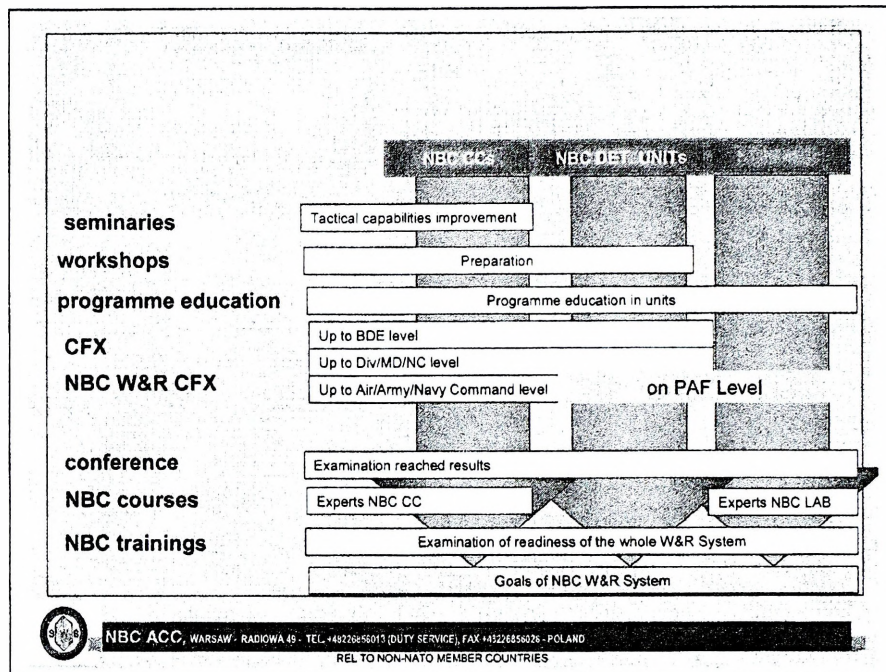


Fig. 9. Training stages of NBC W&R System chains (one year period)

The main part of the improvement process is run while field exercises are conducted. This most important activity is periodically similar to the programme development run in the period of one year. The first quarter of the year is intended to improve BDE level, second Div, third all forces e.g. Air, Army and Navy. Last period is as if summary while the main field exercise with all levels of PI W&R System is being running.

The finally stage of these forces, preparation encompasses NBC conferences, excellence courses, NBC trainings as well as examination's activities.

### CONCLUSIONS:

- PI NBC W&R System is the coherent system which operates due to support in reduction of NBC danger to the Polish Armed Forces as well as citizens of our country;
- this system is a part of NATO W&R System;
- through established cooperation military NBC W&R System with civilian crisis management agencies has gained flexibility, operability and high efficiency PI W&R System;
- the PI W&R System belongs to the aggregated systems of the third row;
- the most important factor time is which determined the value of the system.

**Jaroslav ŽOCHOWSKI**  
**Norbert HOLYSZ**

## **DECONTAMINATION SYSTEM**

All NBC activity contains 5 elements:

- reconnaissance, identification and monitoring of hazards;
- warning and reporting system;
- individual and collective protection;
- minimizing the contamination threat;
- NBC medical protection.

The decontamination is a part of minimizing the contamination threat. The main aim of decontamination is to rapidly and effectively reduce the level of contamination of persons, terrain and object. It is carried out by removing radioactive substances and absorbing, destroying or removing biological and chemical substances. The decontamination referring to operational and tactical conditions might have a passive or active form.

Passive decontamination uses natural processes which occur in the environment like passage of time, sun and wind influence, temperature, rain, sustainability of used weapon. It is used only for the decontamination of terrain, object, materials etc. This process is time-consuming but does not require the use of any material and force. The contaminated areas and objects must be marked and isolated as dangerous areas.

Active decontamination uses technical, chemical and physical processes relying on removing or reducing the level of contamination. The desired result is to reduce the hazard to negligible risk levels.

The following principles guide active decontamination operations:

- Speed - decontaminate as soon as possible to restore full combat potential.
- Need - decontaminate only what is necessary. Consider mission, time, extent of contamination, MOPP status, and decontamination assets available.
- Limit - decontaminate as close to the site of contamination as possible to limit its spread. Do not move contaminated equipment or personnel away from the operational area if it is possible to bring decontamination assets (organic or supporting units) forward safely. This will keep the equipment on location, speed decontamination, and limit the spread of contamination to other areas.

- Priority - decontaminate the most important items first and the least important items last.

The are four levels of decontamination:

- immediate;
- operational;
- partial;
- complete.

Each decontamination is conducted in order to minimize contamination, save lives, and limit the spread of contamination. Ultimately, the goal is to restore operations to a near-normal capacity by reducing or eliminating the need for the IPE. Retrograde of equipment outside the operational area will require additional decontamination.

**Immediate decontamination** is exactly the immediate actions taken by an individual to survive. Individuals conduct immediate decontamination using the supplies and equipment they carry /own kits/. Immediate decontamination consists of:

- skin decontamination;
- personal equipment wipe down.

**Operational decontamination** is conducted to sustain operation, reduces the contact hazard, and limits the spread of contamination. Operational decontamination is carried by individuals and units. It is restricted to specific parts of operationally essential equipment, material and working areas in order to minimize contact and transfer hazards and to sustain operations. It might occur single soldiers and pieces of equipment or vehicles in a bigger range than immediate decontamination.

**Partial Decontamination** is conducted in order to reduce the level of contamination to enable to perform the task. It relies on partial or complete removal of hazardous substances from equipment and people.

**Complete Decontamination** is the most resource-intensive level of decontamination. It requires support of special decontamination units. Complete decontamination aims are to reduce contamination to negligible risks during combat operations. It allows taking off protective suits and carrying out the operation with minimum limitations.

The are three techniques used in complete decontamination:

- detailed troop decontamination (DTD);
- detailed equipment decontamination (DED);

- detailed terrain/object decontamination (DOD).

### Detailed troop decontamination.

This kind of decontamination is provided by personal decon units. Referring to operational and tactical conditions it might be based on civilian infrastructure using shower systems and medical support.

DTD is organized in a line divided into four steps.

1. Step one – decontamination of weapon and warfare materials (ammunition, radio systems, binoculars, night vision systems etc.)
2. Step two – collection of personal equipment and protective suits;
3. Step three – personal decontamination (shower);
4. Step four – medical check and re-equipment.

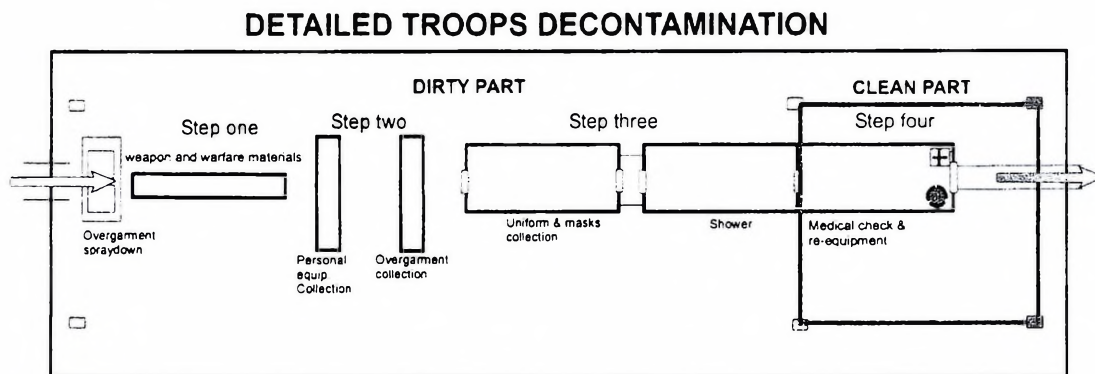


Fig. 1. The plan of DTD line

### Detailed equipment decontamination.

This kind of decontamination is provided by equipment decon units. Referring to operational and tactical conditions it might be based on decon areas or in the battle positions. Prior the decontamination the vehicles have to be unmasked and unloaded.

DED is divided into five steps.

1. Step one – initial wash
2. Step two – application of decon solution;
3. Step three – reaction of decon solution with chemical agents/interior decon;
4. Step four – wash down;
5. Step five – check.

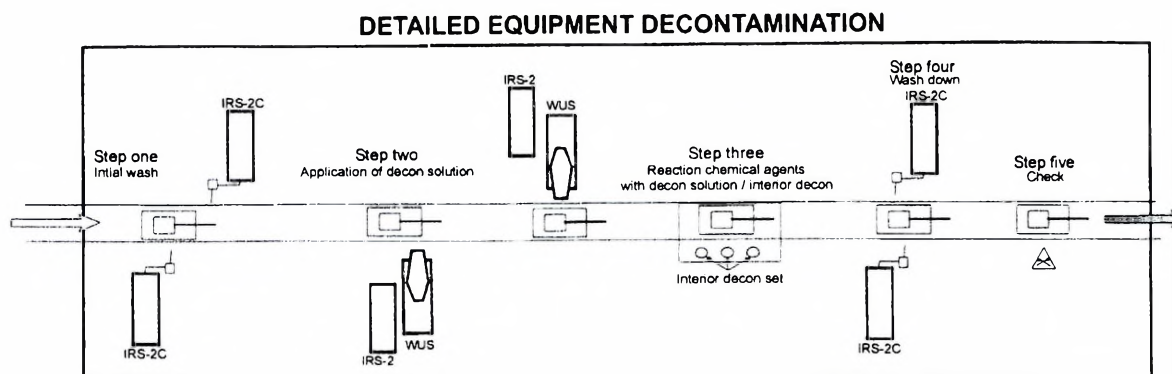


Fig. 2. The plan of DED line

### DETAILED EQUIPMENT DECONTAMINATION ON BATTLE POSITION

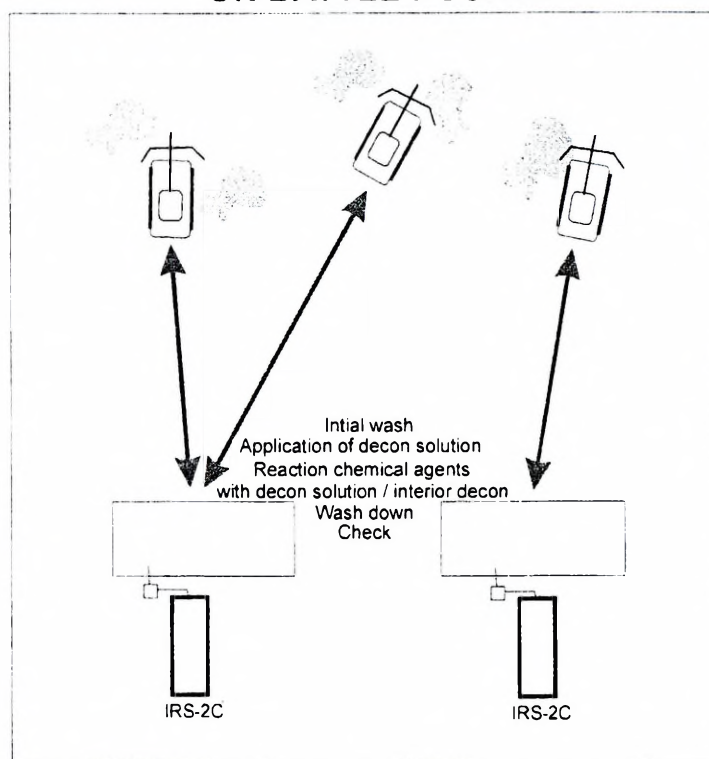


Fig. 3. The plan of DED on the battle position

#### **Detailed terrain/object decontamination.**

This kind of decontamination is provided by decon units.

DOD consists of three steps.

1. Step one – application of decon solution;
2. Step two – reaction of decon solution with chemical agents;
3. Step three – check.

## DETAILED TERRAIN /ROAD/ DECONTAMINATION

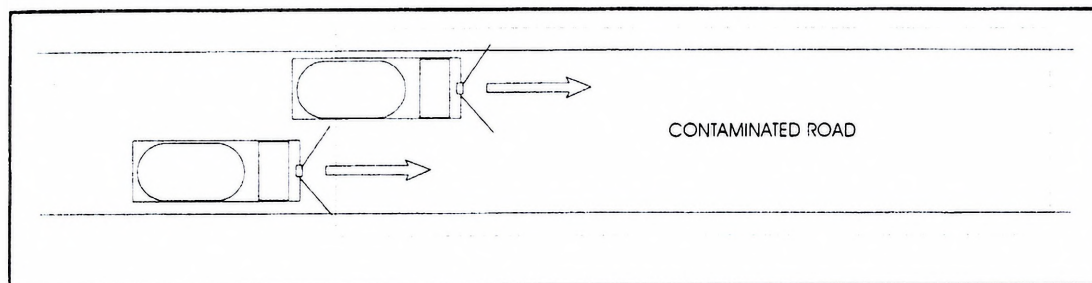


Fig. 4. The plan of DOD of the road

According to the Polish national procedures of decontamination DTD and DED are organized in the same time and place called decon site /DS/. The minimum level to set up DS is a decon platoon, which consists of one personnel decon squad, two equipment decon squads and water pump squad.

The basic elements of DS are:

1. Entry /check/ point - prior decontamination;
2. DTD;
3. DED;
4. Check point - after decontamination;

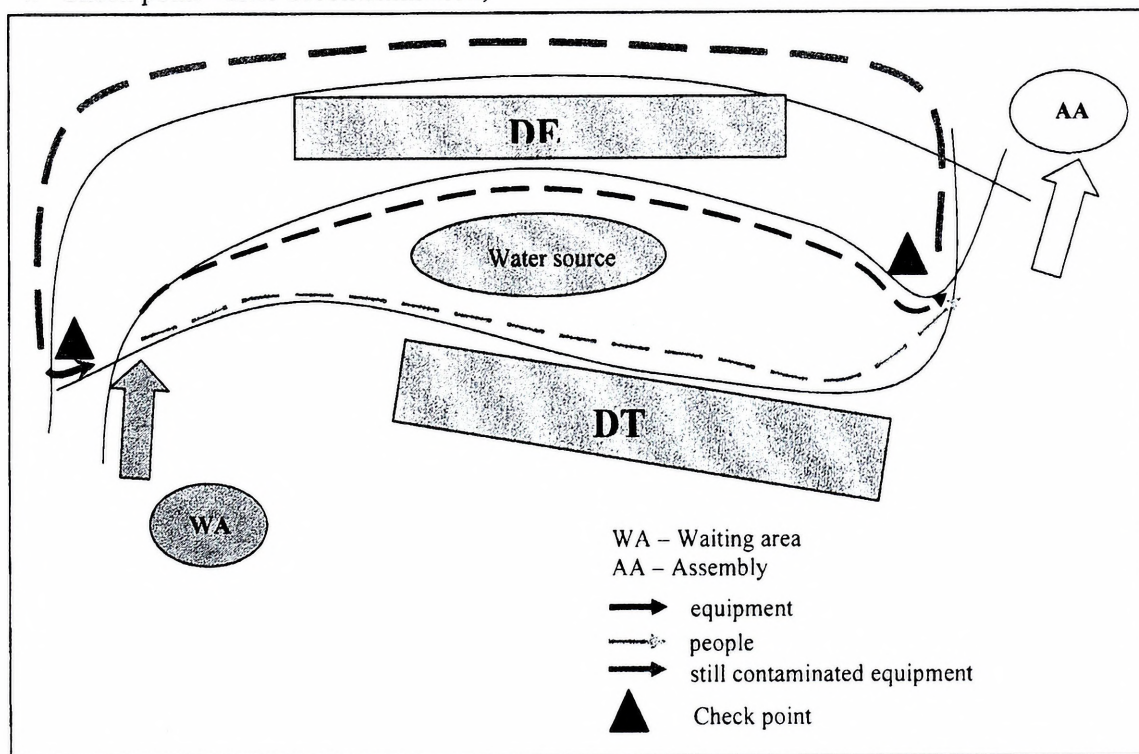


Fig. 5. The plan of DS set up by platoon

A decontamination company has three the same decon platoons. Referring to operational and tactical conditions it can do the tasks entirely as a company or each platoon might do the task itself.

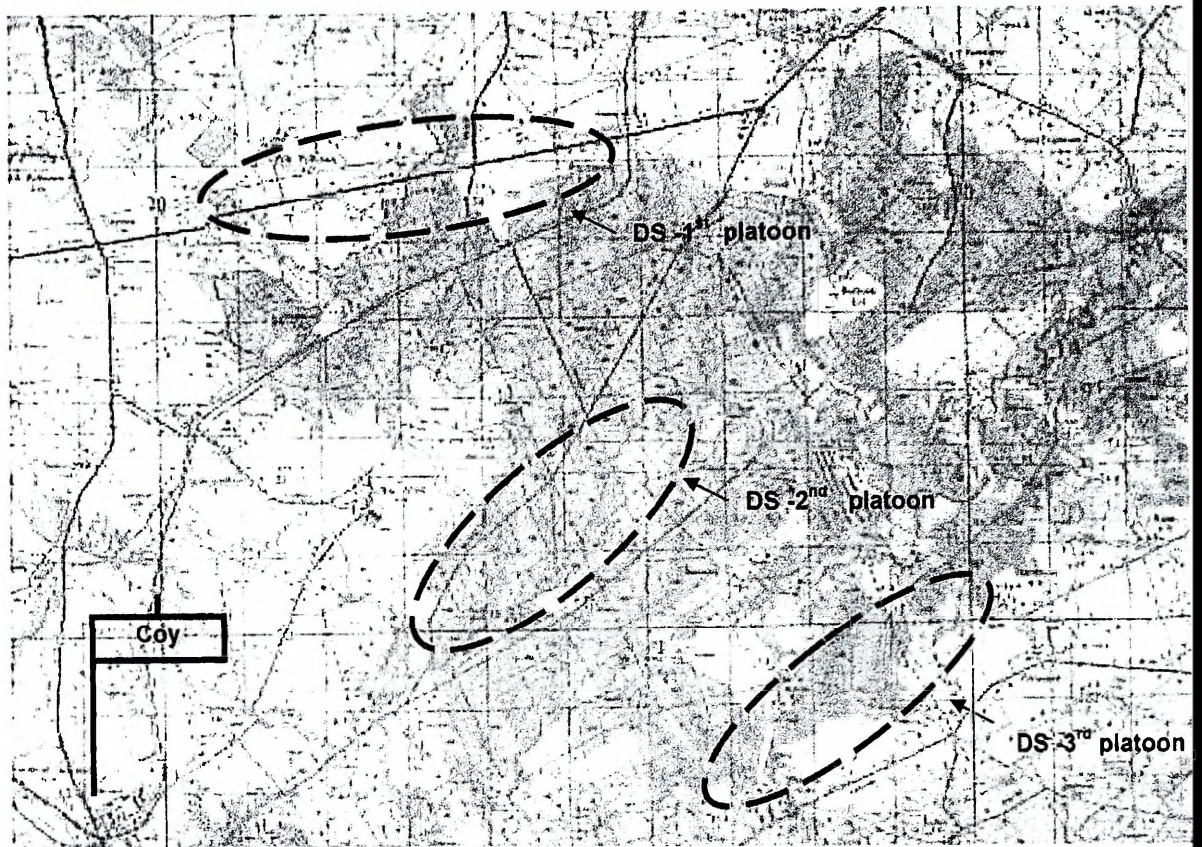


Fig. 6. The plan of decontamination at company level made by platoons itself

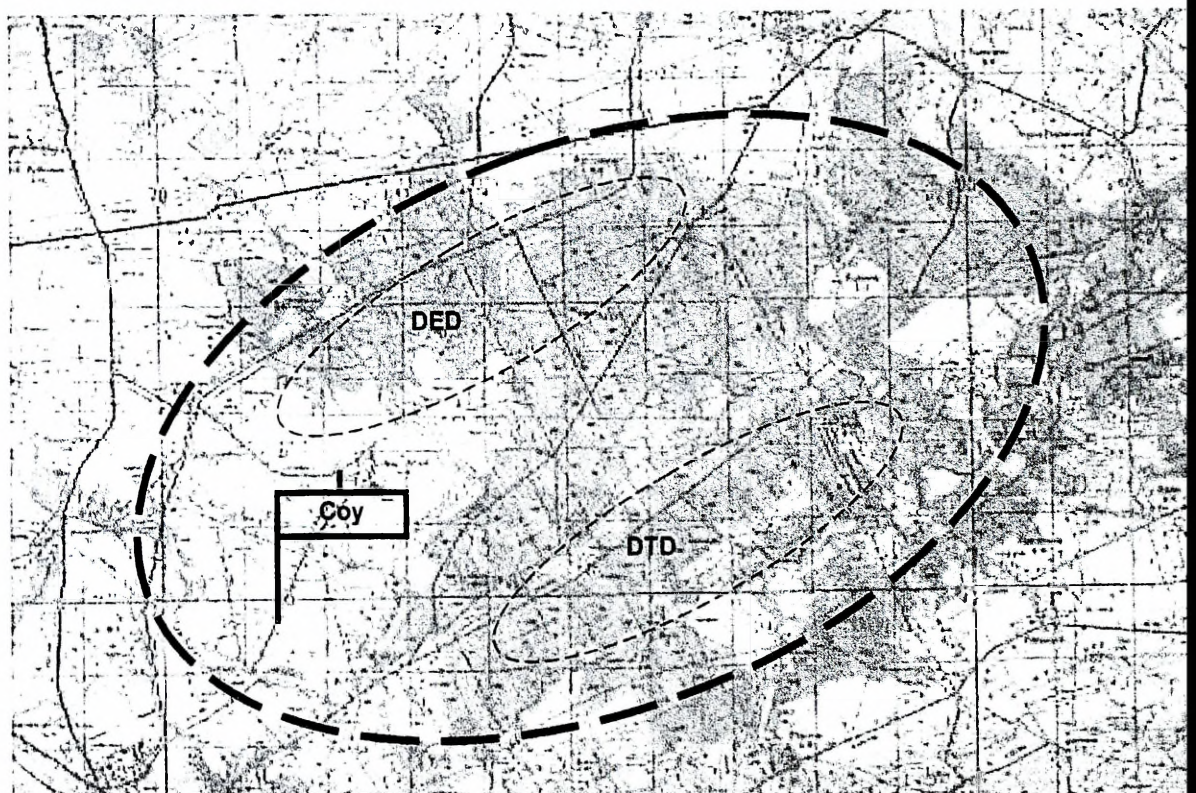


Fig. 7. The plan of decontamination at company level made entirely

**Emil LISIAK**

## **NBC MEDICAL COUNTERMEASURE**

Army conducts operations in areas where potential adversaries could use NBC weapons. Possible threats include nuclear, radiological, biological, chemical warfare as well as toxic/infectious industrial materials. On the NBC battlefield, medical support is focused on keeping the soldiers in the battle. Effective and efficient prevention, triage, emergency medical treatment, decontamination, advanced trauma treatment and contamination control save lives, assure judicious medical evacuation, and maximize the return to duty rate. Health service units must plan, train and routinely practice mass casualties management. The recognition of likely targets, estimation of the number of expected patients and planning of medical supply are strongly needed.

In case of the use of WMD, medical service should be prepared to quick detection (especially biological agents), victim triage and management, decontamination procedures and evacuation to the hospital (if needed). Health support system will be probably overloaded because of huge number of casualties and lack of medical supplies. Before expected NBC attack, personnel of medical facilities should be trained how to survive an attack, operate in a contaminated area and care effectively for NBC patients. During and after the use of WMD, all patients arriving at a medical unit should be checked for the presence of contamination, and decontaminated before treatment (except life – eye- or limb-threatening). On the level I/II an advanced treatment of NBCR victims will be difficult/impossible because of special equipment/drugs needed.

Medical support units operating in a radiation fallout environment will face three main problems: possible contamination of the facility (fallout), multiple injuries, and evacuation problems due to contaminated environments. Decontamination of most radiological contaminated patients and equipment can be accomplished with soap and water. However, the waste can become a concentrated point of radiation and must be managed and monitored.

A biological attack (bomblets, rockets, spray) may be difficult to recognize. Frequently, it does not have an immediate effect on exposed personnel. All members of medical units must monitor BW indicators such as increase in disease or fatality rates and/or sudden presentation of an exotic disease. Treatment of BW agent patients may require observing and evaluating the individual to determine necessary medications, isolation, or management. Medical surveillance is essential. Most BW agent patients initially present common symptoms, such as low-grade fever, chills, headache, and coughs. Trends of increase numbers of patients presenting unusual or the same symptoms are valuable indicators of enemy employment of BW agents. In CW environments, medical personnel must consider that all patients are contaminated. Initial triage, emergency treatment, and decontamination should be

performed on the "dirty" side of medical facility, and life-sustaining care rendered regard less contamination.

The military medical management system is based on the levels of military facilities. On the site of use of WMD medical treatment is supported by first aid in the form of self/buddy-aid and paramedics. Soldiers are equipped with first aid kit, autoinjectors (atropine, obidoxime) against nerve-agents, pocket decontamination set (for skin, eyes and equipment), and radioprotective agents set. On the level I (unit-level), the first medical station is developed. Should an attack occur or a downwind hazard exist, the station must seek out a contamination free area to establish a clean area, or must establish collective protection to continue the mission. Decontamination procedures could be established on this level, as well as medical treatment (mainly life-saving procedures). Decontaminated patients, with injures that require further treatment, will be evacuated to the level II medical treatment facility. Level II provides advanced medical treatment, and has a clearing station and a greater decontamination possibility. Short hospitalization (including infectious suspected and PTSD ward) is possible for soldiers proposed for RTD.

During military operations in NBCR conditions special both engineering/chemical and units are required. In the Polish Army there are Military Centres of Preventive Medicine, responsible for primary detection of BW agents (nuclear and chemical warfare agents detection lies in chemical units responsibility). Mobile epidemiological teams, equipped with protective suits with independent air systems are able to detect, transport and analyze suspicious material.

The epidemiological Reaction Centre is a main military unit proposed to epidemiological reaction in case of NBCR weapon use. Mobile elements including reconnaissance teams, decontamination coy, experts teams and evacuation team will be used in case of mass casualties as a regular military medical service support element.

## **BIOMONITORING SYSTEM**

The end of the 20<sup>th</sup> century and the beginning of the 21<sup>st</sup> brought one of the most perilous threat – terrorism. It is highly probable that weapon of mass destruction, including biological one, can have an application in terrorist attacks on an unprecedented scale. The use of biological weapon and efforts to make it more useful as a means of waging warfare has been recorded numerous times in history: in the past – during war, nowadays – in terrorist action.

The use of biological weapon may lead to the high rate of morbidity and mortality among people and animals, the loss of crops, and as a consequence, incapacitate an enemy to defence and fight. Moreover, it may be also associated with negative psychological effects such as: depression, panic, chaos and a total disorganization of a social life. Being easily accessible, cheap, simple to store, transport distribution, and at the same time, invisible during an attack – biological weapon – is very difficult and tedious to detect according to typical symptoms of the most contagious diseases. The probability of its usage during warfare and terrorist attack, and the fact that research on it is still held, lead to the necessity of preparation of adequate procedures. These operations may allow for the fast detection and identification of biological agents, counteracting against the results of its usage and efficient organizing of special services: the police, the fire brigade, health service and administration.

An early warning of the potential usage of biological weapon is possible today according to continuous monitoring of the environment – terms as **biomonitoring** – due to advanced technology. Poland has the highly developed system of monitoring related to the epidemiological situation and antiepidemic security, which are controlled by the Minister of the National Defence. The specialistic medical surveillance is conducted by the Military Sanitary Inspection and special military squads. The assignments of the Military Sanitary Inspection are realized by the Military Centres of Preventive Medicine scattered all over the country. These centres consist of: Biological Reconnaissance Teams, Environmental Health Teams and Toxicological Teams.

The Biological Reconnaissance Teams are mobile groups whose aims are: appropriate sampling of potentially infectious samples, preliminary identification of etiological agent by the use of physical and immunological methods, and above all, quick and safe distribution of these samples to the reference laboratory.

The Environmental Health Teams, equipped with special vehicles, have to define, through collecting and processing data, the probability of epidemic threat or biological attack. These groups cooperate closely with Provincial Sanitary and Epidemiology Stations, Provincial Fire Brigade Command, Provincial Police Command and Crisis Committee around Provincial Governor's Offices.

Toxicological Teams located around hospital personnel are supposed to give professional medical consultations, complete diagnostic support and therapeutic treatment of severe infections.

The independent medical surveillance is conducted by the Epidemiological Reaction Centre of the Polish Armed Forces, Military Institute of Hygiene and Epidemiology, and military hospitals with their contagious wards.

Epidemiological Reaction Centre of the Polish Armed Forces is a completely mobile military unit, which consists of Mobile Biological Laboratories (sampling, preliminary identification, transport) and Stationary Laboratory with a special computer security system and professional scientific equipment for detailed detection and identification of dangerous pathogens, by the use of modern methods of molecular biology. Furthermore, the Epidemiological Reaction Centre of the Polish Armed Forces participates in the epidemiological surveillance system which is responsible for collecting, analysing and disseminating data.

The Military Institute of Hygiene and Epidemiology is a scientific institute, which improves systems and methods of detection of biological contaminants harmful to people, and deals with environmental threats providing epidemiological investigation.

Military hospitals, with its contagious wards, are prepared for observing, detection and treatment of highly dangerous contagious diseases.

Continuous monitoring of the environment, relating to biological threats, will allow for an early warning about the potential usage of biological weapon, and the application of advanced – for quick detection of biological agents. This technology is based on highly developed immunological methods and genetic techniques which may provide a precise detection of biological factor and localization of its sources. PCR (polymerase chain reaction) is a basic genetic method adequate for all tasks mentioned above. There are also completely automatic systems such as: BIOVERIS, RAPID, which are successfully employed in a battle circumstances and in operations of fast reaction teams. Quick immunological tests (SMART) are also useful, mainly for the purpose of preliminary identification of biological agents in field conditions. It is also worth mentioning about the methods of classical microbiology (bacteria cultivating, biochemical differentiation). However, classical microbiology is not useful in a preliminary stage of identification and detection because of time-consumption, but is really essential for the verification of the results achieved by genetic tests.

## **NBC ANALYSIS**

NBC-ANALYSIS is the Nuclear, Biological and Chemical (NBC) Risk Management information system that has been developed in compliance with NATO STANAG 2103 [ATP-45(B) and AEP-45].

NBC-ANALYSIS is available as a Commercial Off The Shelf (COTS) product, which can be used by either military or civil emergency authorities (Civil Defence or Fire Departments).

The NBC-ANALYSIS can provide immediate information and hazard templates after events involving:

- the offensive use of Weapons of Mass Destruction (WMD);
- accidental or intentional releases of Nuclear, Biological, Chemical or Toxic Industrial Material (TIM);
- terrorist use of WMD.

NBC messages are generated in accordance with the message formatting rules contained in the NATO publication ADatP-3, USMTF & JVMTF to provide information exchange between different systems.

The system gives us answers to the most important question in case of NBC attack or ROTA event: In which direction will the hazard move? How fast? How far? To where should the unit be evacuated? Which areas are safe? Who needs to wear respirators and who does not? What are the consequences of crossing the hazard zones?

The software system automatically calculates the hazard area, utilising meteorological information and instantly displays it on a map of the area of responsibility. The same data is used to identify units and key interest areas at risk.

The NBC-ANALYSIS is able to combine available information and calculate a schedule of events showing which units or key interest installations are in the hazard area, the expected time of hazard arrival and an estimate of when the hazard should have passed.

Basic calculations cover hazard prediction and reports creation due to meteorological factors, advanced calculations cover dose, dose rate, crossing calculations, and damage assessment.

Unit locations with deployment areas, key industrial installations or locations with high population density can be displayed on the map using symbols that are in accordance with the NATO standard APP-6A and US MIL-STD-2525A.

The NBC-ANALYSIS map module can display vector maps, raster maps, aerial photographs, and satellite photos. Maps can be imported using the relevant NATO or US mapping standards, the following types are available VPF, ASRP, CADRG, ADRG, VMAP0, VMAP1, VMAP2, DCW, CIB or CRP.

NBC-ANALYSIS supports the following geographical co-ordinate systems: Universal Transverse Mercator (UTM, WGS84), Military Grid Reference System (MGRS), British/Irish National Grid (BNG/ING) and Latitude/Longitude (degrees, minutes and seconds).

The NBC-ANALYSIS communication module handles the transmission of NBC reports. Communication can be made over military or public telephone lines, secure military radio communications or mobile phones. Reports can also be passed via cable, Local Area Networks (LAN) or the existing communications utility in Windows. E-mail and fax can also be used.

NBC-ANALYSIS works seamlessly with SensAware<sup>TM</sup>, which interfaces with different types of sensors.

An additional EOD (Explosive Ordnance Disposal) module is available for calculations based on hazards arising from Improvised Explosive Devices (IED) or Unexploded Ordnance (UXO).

Diffusion models can be incorporated into NBC-ANALYSIS in order to provide extensive details on predicted hazard areas beyond ATP-45 capability. NBC-ANALYSIS currently interfaces the US developed HPAC model from Defence Threat Reduction Agency (DTRA) and the Dutch developed HAPPIE/RIOT model from TNO.

The system possess some slight disadvantages and the pure software is more valuable for military purposes but integrated with mentioned above software based on diffusion models and constitutes powerful mission planning tool for high-profile operations.

**Artur ZDROJEWSKI**

## **EPIDEMIOLOGICAL REACTION CENTER OF THE POLISH ARMED FORCES**

Epidemiological Reaction Centre (ERC) is a medical unit subordinated to Surgeon General of the Polish Armed Forces as a main unit responsible for medical management of NBCR casualties and recognition of BW over the country and during abroad missions. Main tasks include:

- protection against mass illnesses caused by bioterrorist attack or the appearance of an highly infectious disease;
- quarantine and medical evacuation of infected people or those suspected of infection;
- sampling of potentially infected material (air, soil, water, food);
- secure packaging and transport of the collected samples to the lab;
- final disinfection and extermination of vermin depending on the epidemiological situation in the operational area;
- identification of the biological factors of the infectious disease;
- collecting and analyzing epidemiological data in military operation area;
- participation in consequences management of natural or industrial accidents and disasters;
- elimination of infectious diseases foci and extremely pathogenic factors caused by biological weapons;
- antiepidemic activities concerning infectious diseases foci;
- final disinfection and other antiepidemic activities depending on the disease and the epidemiological situation in the operational area;
- medical advising (NBCR);
- executing (in cooperation with chemical units) necessary sanitary activities (showers or baths, neutralisation, disinfection, deratisation, exterminating vermin);
- collecting operational data;
- epidemical protection activities - planning and organisation: (vaccination, supervision of the vaccination process);
- provision of antiepidemic support to military units;
- detection, identification and elimination of animal infectious diseases factors from military areas of responsibility;
- conducting preventive epidemic examinations and investigations.

The centre consist of both mobile and stationary elements. Mobile reaction teams are able to identify suspicious probe, isolate hot-spot area and conduct primary decontamination. During last year the Centre has been partially equipped with the modern mobile laboratory equipment, including portable PCR, meeting the NATO requirements. Evacuation team equipped with special protective boxes is proposed to conduct safe evacuation of infected patients. NBC resistant tents allows to establish field hospital with infectious ward. Experts teams are groups of medical/psychological advisors in NBC-related topics, estimated to coordinate and advise in medical treatment of CBRN casualties, provide estimation of the number of victims and conduct epidemiological investigations.

Planned stationary laboratory will be BSL 2 however there are plans to upgrade to level 3. Until the opening the lab, personnel improve knowledge and experience based on another military and civilian diagnostic facilities. Data analyses team collect epidemiological information from Military Centres of Preventive Medicine, conduct analyses and report to above level. Based on both military and civilian databases provide also infectious disease occurrence monitoring.

## **HPAC OVERVIEW**

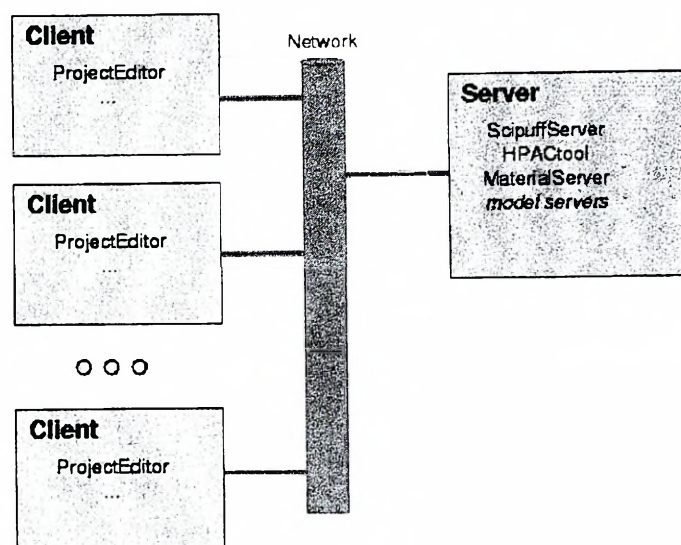
The potential for the release into the atmosphere of hazardous materials (such as Chemical, Biological, Radiological, and Nuclear, CBRN) is an increasing problem in this technological age. Hazardous releases can occur due to industrial accidents such as that occurred in Bhopal, India in 1984, the Chernobyl nuclear disaster that occurred in Ukraine in 1986, etc. More recently, modern military conflicts and terrorist activities are occurring with increasing regularity in urban settings such as the events of September 11th in New York City. This is a cause for concern because the exposure of large populations to military and terrorist activities presents the possibility of mass casualties when weapons of mass destruction are used.

When a chemical, biological or radiological (CBR) incident occurs, those responding need a reliable and timely assessment of the hazard. Estimates of the position of "hot" (high-risk) areas and their likely spread over time are vital in organising a response, and in helping to make appropriate decisions concerning matters such as evacuation. Atmospheric dispersion models are used to predict the progression of a plume of hazardous material in the air. However, the models must not only be able to predict the initial dispersion of the material, but also include an estimate of any subsequent hazards. For example, in a chemical incident the initial cloud of gas and liquid will be modelled, but the evaporation of liquid that settles on the surface needs to be taken into consideration as well. When the hazard is radiological it is important to model the initial cloud, the settling of particles out of the atmosphere and the subsequent hazard that this deposition poses due to ionising radiation emissions.

The Hazard Prediction and Assessment Capability is an atmospheric dispersion modelling tool developed for civilian and military operations which predicts the effects of hazardous material releases into the atmosphere and its human collateral effects on civilian and military populations. The Defence Special Weapons Agency (DSWA), and later the Defence Threat Reduction Agency (DTRA) developed this tool to provide quick response to threats from weapons of mass destruction. This has been accomplished by using a suite of programs to read in meteorological data and interpolate it to a user-defined grid, describe in detail the source configuration, and run a transport and diffusion code to generate output in a variety of ways (i.e. concentration, dose, etc.). The main code used within HPAC for transport calculations is the Second - Order Closure Integrated Puff model (SCIPUFF, Sykes et al. 1993, 1998). SCIPUFF describes diffusion processes using second-order turbulence closure by relating the dispersion rate to velocity fluctuation statistics, and has the added advantage

of providing variance in the concentration fields, allowing for a measure of uncertainty in the result.

HPAC was originally developed as a standalone Windows application with a tight coupling between the user interface and the calculation engine. Understandably, the early stages of HPAC development were focused on scientific methodologies and correct results. Nonetheless, a demand for HPAC on other platforms and the need to integrate HPAC with many other tools and systems called for a new architecture. Consequently, HPAC has been re-engineered to a client-server, distributed object architecture readily portable to other platforms.



HPAC system requirements call for three basic modes of deployment:

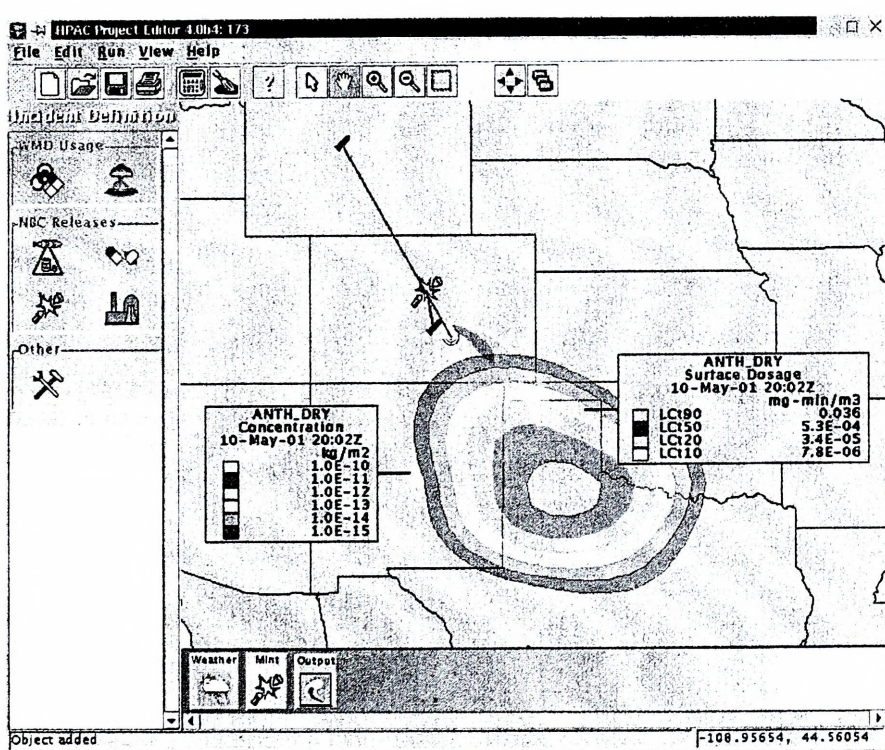
- a standalone system with no network connection;
- a client-server arrangement with data available on the client but calculations performed on a server (heavy client);
- a client-server environment with data downloaded to the client from the server and calculations performed on the server (thin client).

The HPAC Project Editor provides interactive editing and viewing of HPAC projects. As a graphical user interface, it represents a new paradigm based on geographic representation of the elements of a project.

HPAC has different types of incident modules for use in modelling scenarios. These modules include conventional attacks on biological and chemical facilities, accidents at nuclear facilities, nuclear weapon incidents, nuclear weapon detonations, chemical weapons, biological weapons, missile intercepts, and smoke and obscurants.

There are numerous different types of output that HPAC can produce including dose rates, concentration and deposition levels, doses to various organs, and even casualty and fatality estimates with other related parameters.

HPAC has an interesting structure in that it is designed for two very different types of users – operational and analytical. Operational users are those responding to actual events, and define a scenario in terms of the incident. Analytical users tend to employ HPAC for research and development purposes, and define a scenario in terms of the release parameters. Incident models let the user describe a release in terms of where, what and when. The release information is calculated and then passed to the mentioned above transport model that models the dispersion. The concentration field is represented by a collection of Gaussian puffs, with expected or mean concentrations available at any point.



However, due to the second-order nature of the method, statistical variance in the concentration field can also be calculated. This gives HPAC a huge advantage over other models as it can provide not only an estimate of the dispersion of the material, but place probabilistic limitations on the accuracy of the prediction.

For best results of dispersion, HPAC requires detailed meteorological data, such as surface observations of wind speed and direction, temperature, pressure, cloud cover and atmospheric stability. For large domains, where the hazardous material is likely to reach high into the air, profiles of the upper air conditions are also required. HPAC can also include weather forecasts to give emergency responders a prediction of the extent of travel of the hazardous material.

HPAC distribution provides worldwide coverage of 12 map layers. Additional map layers from sources other than the HPAC distribution can be loaded into Map Projects as well.

HPAC has the capability to include terrain, land-cover and detailed meteorological data for increased accuracy, but can also be used without any of the above, making it quite flexible in operational use. For example, early in an incident, HPAC can be used to give initial estimates of likely hazards, and can be rerun quickly when more data (source, meteorological, etc) is available. Included with the HPAC installation discs is the Digital Terrain Elevation Data (DTED), a worldwide database of terrain elevation using a resolution of 30 arc second squares (approximately 1 km<sup>2</sup>). The National Imagery and Mapping Agency (NIMA) produced the DTED database, which was then reformatted and compressed for use by HPAC. The Hazard Prediction and Assessment Capability (HPAC) has occurred a powerful tool that has been used to model numerous CBR scenarios since the mid 90s, including the Atlanta Summer Olympics in 1996, 2002 Winter Olympics in Salt-Lake City, 2004 Summer Olympic Games held in Athens, 2006 Winter Olympic in Turin.

**Grzegorz NYSZKO**

## **MISSION, TASKS OF THE MILITARY INSTITUTE OF CHEMISTRY AND RADIOMETRY**

The Military Institute of Chemistry and Radiometry (MICR) is a scientific and research centre of the Polish Ministry of National Defence established in 1954. The main activity of the Institute is scientific research and development projects and studies in the field of the NBC defence armament and military equipment and systems, as well as disarmament and arms control processes.

The Institute holds an authorization for evaluation, testing and expertise of the products and technologies related to weapons of mass destruction and environmental protection. In these areas the Institute carries out several activities for Army purposes and national economy, like sampling and analysis PCDD's and PCDF's, quantitative evaluation of heavy metals in food and bioelements in hair. The Institute carries out testing of the NBC protection equipment and NBC training.

The Institute comprises five science and research departments:

1. Department of skin protection, smoke and incendiary agents.
2. Department of NBC decontamination and operational evaluations.
3. Department of chemical reconnaissance.
4. Department of dosimetry and radiometry.
5. Department of respiratory protection.

The Institute also includes a Product Certification Unit, Technical Expertises Unit, Centre of Scientific Military Information and Proving Ground.

Product Certification Unit certifies reconnaissance, decontamination and NBC protection equipment and products of similar destination used in other branches (environmental protection, rescue service).

Technical Expertises Unit performs evaluations and expertises and gives opinions for the needs of:

- concessioning of producers and suppliers of military and police products by the Ministry of Internal Affairs and Administration;
- issuance of licensed by the Ministry of National Defence to run businesses connected with the use of substances stated in the Chemical Weapon Convention (CWA);
- Product Certification Unit in the certification process.

Department of skin protection, smoke and incendiary agents performs scientific research and development studies and projects in the field of:

- protective materials technology and insulating and filtering clothes fabrication;
- smoke generating and incendiary agents as well as related equipment;
- resistance to the thermal impulse of materials and equipment;
- radiation screening materials;
- screening and barrier materials and reusable corrosion protective covers used for military equipment storage;

Department of NBC decontamination and operational evaluations performs scientific, research and development studies and projects in the field of:

- decontamination technology, means and equipment;
- protection of military equipment surfaces by using special coatings against chemical and radiological contamination;
- means of skin protection and decontamination;
- chemical compounds included in the Schedules of the Chemical Weapons Convention synthesis.

Department of chemical reconnaissance performs scientific, research and development studies and projects in the field of:

- detection and identification of high toxic chemical compounds (CWA and TIC);
- evaluation and testing of means and equipment for chemical reconnaissance;
- qualitative and quantitative chemical, instrumental analysis;
- analytical verification of the implementation of the CWC.

Department of dosimetry and radiometry performs scientific, research and development studies and projects in the field of:

- nuclear radiation detection technologies and equipment;
- measurement of selected parameters of nuclear radiation fields;
- gamma and neutron radiation propagation in shielding materials;
- calibration check of RADIAC equipment used in radiological protection;
- special mobile systems of nuclear radiation detection.

Department of respiratory protection performs scientific, research and development studies and projects in the field of:

- means of individual and collective respiratory protection;
- testing methods and technology of sorption and filtration materials;
- laboratory and operational military evaluation methods, testing requirements for inspection and acceptance of protection equipment.

According to contemporary battlefield requirements NBC defence equipment of the Polish Army is still being improved. Among the equipment developed in MICR and introduced into service in last years there are:

- Deployable NBC laboratory;
- Deployable NBC sampling set for SIBCRA system;
- NBC reconnaissance post;
- Light collective protection system;
- Protective suits;
- Battalion decontamination set;
- Smoke equipment.

## APPENDICES

Presentations presented during a course:

1. NBC Defence Training Centre in the Polish Armed Forces.....	77
2. Proliferation of WMD - threat and new challenge. WMD terrorism.....	87
3. Nonproliferation of WMD – States Policies.....	102
4. Nonproliferation of WMD – International Organizations.....	108
5. CBRN Crisis management .....	111
6. Weapon of Mass Destruction.....	127
7. Detection, Identification & Monitoring.....	141
8. Physical Protection.....	146
9. NBC Warning and Reporting System of the Polish Armed Forces.....	156
10. Decontamination System.....	164
11. NBCR Medical Countermeasure.....	172
12. BIO Monitoring System.....	195
13. Counter terrorism operations.....	215
14. NBC Analysis.....	219
15. Epidemiological Reaction Centre of the Polish Armed Forces.....	228
16. HPAC Overview.....	236
17. Mission, tasks of the Military Institute of Chemistry and Radiometry.....	268

**NATIONAL DEFENCE UNIVERSITY**  
**THE NBC DEFENCE TRAINING CENTRE**



# **The NBC Defence Training Centre in the Polish Armed Forces**

*Presented by* COL Leszek SŁOMKA

## *Agenda*



1. Mission
2. Tasks
3. Readiness
4. Structure
5. Participants
6. Courses
7. Co-operation
8. Exercise



## *Mission*



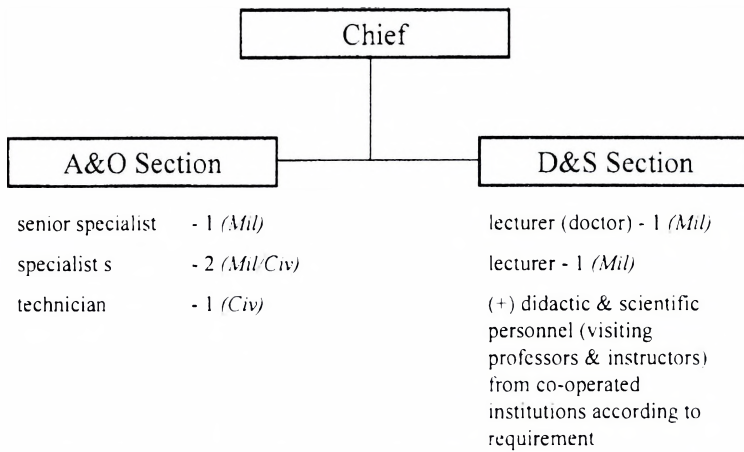
- Enhance the national NBC defence capabilities to address threat coming from proliferation of WMD and terrorism
- Provide senior military and civilian staff of the Polish Armed Forces as well as civilian staff responsible for crisis managing with appropriate NBC Defence training

## *Tasks*

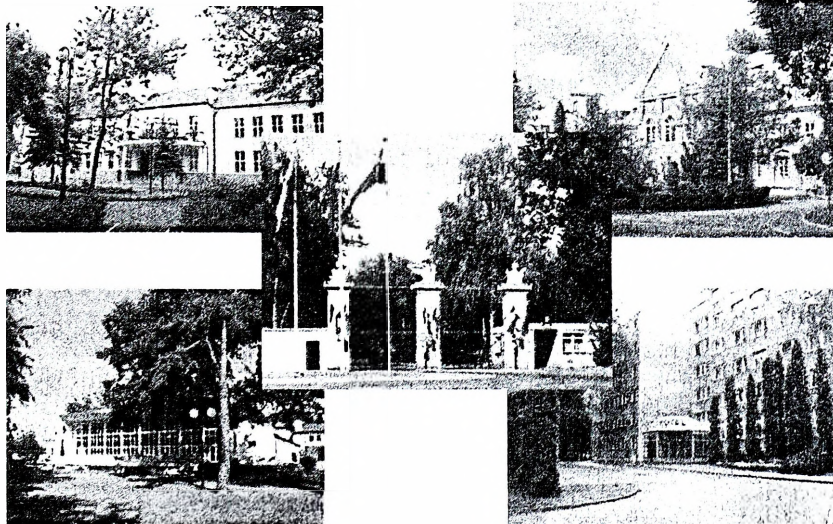


- conduct training (courses) for senior military and civilian staff as well as didactic and research activities
- create and initiate new NBC Defence courses
- co-operate with national military and civilian institutions as well as with appropriate NATO and EU agencies and working groups

## Structure



## Facilities



## *Participants*



### **Courses - the main form of training for:**

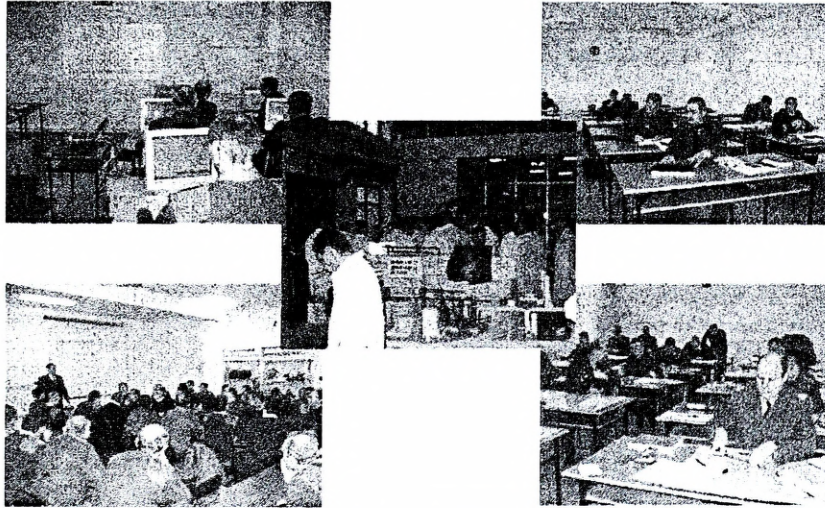
- senior officers of the Polish Armed Forces
- senior civilian and military staff of MoD
- senior civilian staff (government & council level) responsible for managing crisis involving NBC threat
- NBC military specialists

## *Courses*



- Number of participants: **10-15 per course**
- Training period: **1, 2, and 3-week**
- Types:
  - **Military**
  - **Civilian**
  - **„Open”**

## *Military Courses*

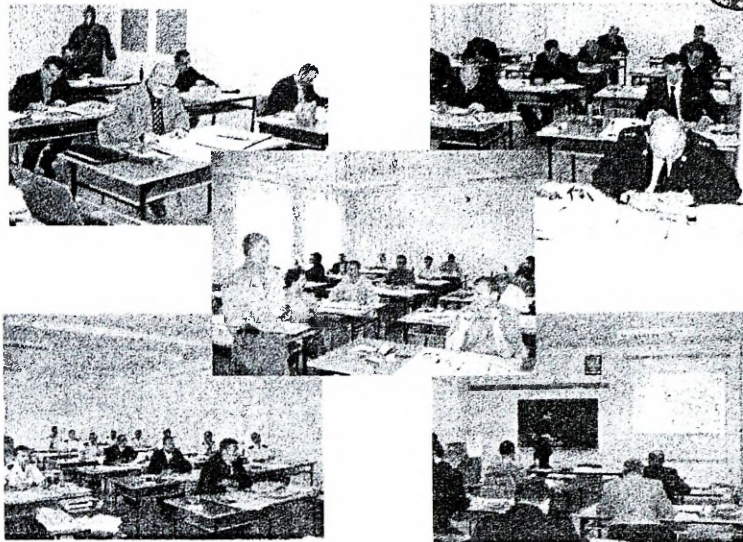


## *Courses 2005/2006*



- » **NBCDPC**, NBC Defence Policy Course (*BG/COL*)
- » **NBCDOC**, NBC Defence Orientation Course (*COL/LCOL*)
- » **BIODC**, BIO Defence Course (*Med. personnel*)
- » **NBCDAC**, NBC Defence Advanced Course (*NBC personnel*)
- » **NBCWRSC**, NBC W&RS (ATP-45B) Course (*NBCW&RS personnel*)
- » **RADPC**, RAD Protection Course (*Tech/NBC personnel*)

## *Civilian Courses*



## *Courses 2005/2006*



- » **WMDNPC**, WMD Non-Proliferation Policy Course  
*(Parliament and Ministry Level); NOV'06*
- » **CBRNDOC**, CBRN Defence Orientation Course  
*(Government & Council Level)*
- » **NNBCWRSAC**, National NBC W&RS Advance Course  
*(NBCW&RS personnel)*
- » **NNBCWRSBC**, National NBC W&RS Basic Course  
*(NBCW&RS personnel)*

## *„Open” Courses*



## *Courses 2006*

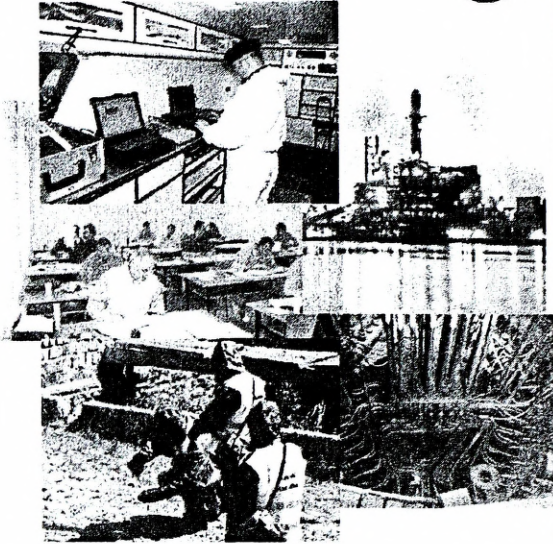


» **NBCDOC**, NBC Defence Orientation Course  
(MAJ/LCOL)

## Forms of training



- lectures
- presentations
- visits
- exercises:
  - map
  - computer
  - laboratory
  - field



## Co-operators



## *Multinational Co-operation*



- extend the co-operation in the field of NBC Defence training with NATO and EU body
- extend the bilateral co-operation [!]
- establish *Program of Exchange Speakers (Instructors)*



## *Multinational Co-operation Visits*



*German Armed Forces*



*Malaysian Armed Forces*



*US Army*



*Portugal Air Forces*



*TV Channel - Russia*



*Spain Armed Forces*

*Field Exercise*



## Proliferation of WMD - threat and new challenge.

### WMD terrorism.

Pawel Durys  
Defence Policy Department  
Polish Ministry of National Defence

## Objectives

- Define and discuss WMD proliferation threat
- Define and discuss the four categories of WMD: Chemical, Biological, Radiological and Nuclear (CBRN)
- Describe the short- and long-term effects of a WMD use
- Explore varying means of delivery of a WMD
- Define terrorism
- Outline history and linkage between WMD and terrorism
- Describe methods of WMD acquisition by terrorists
- Explain how WMD can help terrorists advance their goals

## Agenda

- Issue of proliferation
- Definition of WMD
- Advantages and disadvantages of WMD use
- Short- and long-term effects of a WMD incident
- Methods of deployment, release, and dispersal
- Physical forms of WMD and dissemination
- Definition of terrorism
- The link between terrorism and WMD
- Incentives and disincentives for using WMD by terrorists
- Evaluate risk of WMD use by terrorist
- Conclusions

## Key Security Threats and Challenges

- International community faces three key threats
  - Proliferation of Weapons of Mass Destruction
  - International terrorism, and
  - Failed states
- Proliferation of Weapons of Mass Destruction = growing access to WMD-related materials, technologies, means of delivery and expertise

## The Proliferation Threat

- States that have acquired or are attempting to acquire indigenously a WMD capability
- The growing trade and technical co-operation between proliferators (secondary proliferation)
- The emerging threat posed by non-state actors
  - Private companies
  - Proliferation networks
  - Terrorist groups
- Technological progress and application of WMD technologies for peaceful use

## Threat Assessment

- America's National Security Strategy
  - *„Prevent our enemies from threatening us (...) with weapons of mass destruction”*
  - *„Terrorists (...) continue to pursue WMD”*
- NAC Istanbul 28 June 2004 „Our Security in a New Era”
  - *„We remain committed to address vigorously the threats facing Alliance (...) They include terrorism and the proliferation of weapons of mass destruction”*

## Response to Proliferation of WMD

- A three-phase approach to deal with the WMD threat
  - To discourage and to prevent the development or acquisition of WMD
  - When obtained to deter their use or threat of use
  - To defend against their use

## Weapon of Mass Destruction

- Many definitions
- Define a WMD as:
  - any destructive device including CBRN agents
  - poison gas
  - any weapon involving a disease organism
  - any weapon that is designed to release radiation or radioactivity at a level dangerous to human life

## General Categories of WMD

- Chemical Agents
- Biological Agents
- Radiological Dispersal Devices
- Nuclear Devices

## Chemical Weapon Definition

- Toxic chemicals or chemical munitions intended to cause death or other harm
- Chemical weapon agents can be
  - Toxic industrial chemicals
  - Toxic chemicals
  - Military-use chemicals

## Advantages and Disadvantages of CW

- Do not have to be pure to cause casualties
- Effects are rapid
- May be used to incapacitate or kill
- Cause panic, chaos, and terror
- Dangerous to maker and user
- Need expertise and special equipment to produce in large quantities
- Require
  - Protective equipment
  - Special handling

## Biological Weapon Definition

- Microbial or other biological agents, or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes
- Weapons, equipment, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict

## Characteristics of Biological Agents

- Definition - a pathogen or toxin developed for biological warfare
- Types
  - Pathogens (bacteria and virus)
  - Rickettsia
  - Toxins
- Short incubation period
- Virulent
- Consistently provides effect in small doses
  - Incapacitation
  - Death
- Some can be stable
  - During manufacture
  - After dissemination

## Advantages and Disadvantages of BW

- Only small amount of microbial bio-agent needed
- Do not have to be pure to cause casualties
- Among the most toxic agents known
- Inexpensive
- Production requirements simplistic
- Easy to conceal
- Wide range of targets
- Cause panic, chaos, and terror
- Difficulties
  - Must protect handlers
  - Must maintain quality control
  - Must sufficiently contain agents
  - Delivery
  - Storage
  - Post-release

## Radiological Dispersal Device

- Radioactive material placed together with low order explosives
- Designed to disperse material over a large area
- Dispersal affected by weather conditions (wind, humidity, temperature)
- Would employ highly radioactive isotopes

## Radiological Material Dangers

- Can pose both an acute and long-term hazard to humans
- Do not have to be inhaled or come in contact with the skin
- Can penetrate significant layers of protective material

## Nuclear Materials

- Fissionable and other radioactive weapon materials
- Weapons or materials acquisition
  - Stolen or illicit weapons or materials
  - Covert production capability
  - Reactor attacks
- Improvised Nuclear Device
  - Sufficient quantity of weapon grade material required
  - Technical expertise required for construction

## Advantages and Disadvantages of NW

- High impact weapon
  - Mass casualties
  - Damage to a country's economy
  - Long-term environmental damage
  - Psychological effect
- Technical, logistical, and safety obstacles
- Difficult to obtain the technology and materials
- Difficult to conceal and transport

## Some Physical Forms of WMD

- Aerosol
  - Dispersed as a fine mist or gas (chemical or biological)
  - Large areas easily contaminated
  - Effective dispersal for chemical agents
- Solid
  - Dispersed as powder, granules, or other solid forms
  - Some chemical agents, many biological agents, most radiological agents, can be disseminated in this form
- Liquid
  - Exists normally when containerised
  - Some vaporise when exposed to air
  - Many chemical agents and some biological agents are designed to be disseminated in liquid form

## Dissemination Devices

- Categorised by the method and form in which they release an agent
- Can easily be disguised as something else
- Can impact the effectiveness of the agent or pathogen
- Dissemination devices
  - Breaking devices
  - Bursting or exploding devices
  - Mechanical spraying devices
  - Vectors
  - Standard munitions and launch platforms

## Sources of WMD Materials

- Poorly secured weapons and / or research programs
- Countries with a profit or proliferation motive
- Orphan and found materials
- Stockpiles made vulnerable through privatisation

## Terrorism and Definition of Terrorism

- Many definitions
- Define a terrorism as
  - Violent acts or acts dangerous to human life that are a violation of the criminal laws and that appear to be intended to intimidate or coerce a civilian population; to influence the policy of a government by intimidation or coercion
- Structure and organisation
  - Individuals extremists
  - Formal terrorist organisations
  - State sponsors of terrorism
  - Global Jihad Movement

## The Link Between Terrorism and WMD

- Growing evidence terrorists seeking ability to use CBRN materials to cause mass casualties
  - Terrorist cult Aum Shinrikyo
  - Al Qaeda
- Some states sponsors of terrorism have programs to develop WMD
- More than 25 recorded WMD attacks to date

## WMD: Advancing Terror Goals

- Cause mass casualties and chaos
- Instil panic and confusion
- Instil a sense of vulnerability and insecurity
- Overwhelm emergency response systems
- Encourage militants in other countries
- Inspire others to join cause
- Damage the economic infrastructure of a city, region, or country
- Influence national government decision
- Affect elections

## Terrorist Incentives to Use WMD

- Small weapon and possibly small investment equals large result
- Psychological damage
- Demonstrate the inefficiency and ineptitude of the government
  - Loss of public confidence
- Trauma associated with being a victim can inhibit proper medical triage
  - Tokyo subway example
  - Competition for medical treatment
- Shift spending from offensive operations to defensive preparation

## Terrorist Disincentives to Use WMD

- Can inhibit support and recruitment depending on target and casualties
- Creates willingness to retaliate against the terrorists and sponsors
- Some WMD attack methods difficult to control

## Considerations for CB Attack

### Deliberate releases of nerve or mustard agent

- Target unsuspecting and unprepared population
- Enclosed space to concentrate agent
- Atmospheric conditions
  - Some have sensitive to humidity
  - Quickly dispersed by wind

### Deliberate release of smallpox, anthrax, plague, or other organism

- Target unsuspecting and unprepared population
- Mobile international population conducive to rapid spread of an organism
- Enclosed space to confine and concentrate agent
- Atmospheric considerations
  - Sensitive to temperature
  - Sensitive to wind and humidity

## Considerations for RN Attack

### Considerations for a Radiological Attack

- Stolen nuclear waste material is spread or positioned in an area to cause radiological exposure to the public
- Explosion would distribute radiological material over a wide area
  - Movement of people will further distribute material
  - Symptoms of radiological exposure appear hours to days after attack
- Could be misconstrued as a nuclear attack

### Considerations for Nuclear Weapons Use

- Must overcome technical, logistical, and safety obstacles
  - No terrorist group has yet demonstrated a means to overcome these obstacles
- Building the bomb is difficult; theft more likely
  - First option: build crude device using stolen plutonium or highly enriched uranium
  - Second option: buy a stolen weapon

## Evaluating the Risk of WMD Terrorism

- Have terrorist organisations come into possession of CBRN agents?
  - Direct military sources from state sponsors of terrorism
  - Stolen weapons or materials
  - Scams
- Could terrorist organisations develop their own WMD?
  - Open sources information available in printed media and internet
  - Weapons expertise can be hired
- *“While we still assess that a mass casualty attack using relatively low-tech methods will be their (terrorist) most likely approach, we are concerned that they are seeking weapons of mass destruction including chemical weapons, so-called ‘dirty bombs’ or some type of biological agent such as anthrax”*
  - FBI Director Mueller, Feb 05

## Conclusions

- The proliferation threat is evolving
- Proliferators have global reach and potential to harm all states
- Wide range of WMD material and delivery options
- Likelihood and impact of WMD incidents are variable
- Complications of WMD limit widespread use
- Potential outcomes of use can be significant
- The link between WMD and terrorism is real and credible
- Incentives for terrorist organisations to pursue WMD can be countered with active measures to decrease the favourability and increase the cost
- A co-ordinated, international approach is required to address the WMD / WMD terrorism threat

# **Nonproliferation of WMD – States Policies**

Mr. Piotr Pacholski  
Defense Policy Department  
Ministry of National Defense, Poland

## **Answering the questions:**

- **What is the role of WMD proliferation in international security?**
- **What measures can states take against this threat?**

## **WMD proliferation in international security**

- **Cold War vs. new WMD threats**
- **Deterrence**
- **World Order and WMD**

## **Typology of nonproliferation activities**

- **Legal activities**
- **Political / diplomatic activities**
- **Economic activities**
- **Military activities**

## **Legal Activities**

- **establishing of general norms in international law (ius cogens)**
- **adopting international agreements**
- **establishing internal law supporting countering WMD proliferation**

## **Political / diplomatic activities**

- **shaping the political will to adopting legal tools for non-proliferation**
- **shaping the political will to react of non-compliance behaviors**
- **building the political atmosphere for undertaking appropriate actions in WMD nonproliferation**

## **Economic activities**

- **executing and promoting the prohibition of WMD components or dual-use goods exchange**
- **executing or promoting general trade sanctions**

## **Military activities**

- **providing reconnaissance of states and non-state actors WMD related activities**
- **developing political-military cooperation with other countries in elimination of WMD**
- **using military power projection as an argument to change proliferator`s policy**
- **using military capabilities to prevent (interdict) acquisition of WMD related materials**
- **using military forces to disarm and implement the nonproliferation policy**

## **Nonproliferation policies of key states**

### **United States**

- **Multilateralism vs. Unilateralism**
- **Nonproliferation**
- **Counter-proliferation**
- **Negative Security Assurances**

## **China**

- **Support for multilateral activities in nonproliferation**
- **New regulation in arms export control**
- **Discussable cooperation with Iran and North Korea**

## **Russia**

- **Russian support for nonproliferation regimes**
- **Nuclear potential as strategic value**
- **International support in disarmament of Russian WMD**
- **Russian role in current nuclear crises**

# **Nonproliferation of WMD – International Organizations**

Mr. Piotr Pacholski

Defense Policy Department  
Ministry of National Defense, Poland

## **Answering the questions:**

- **What role play international organizations in nonproliferation efforts?**
- **What are conditions for nonproliferation in international organizations?**

## **United Nations**

- **Role of United Nation Security Council**
- **Disarmament Conference in Geneva**
- **UN supportive role in reviewing processes of NPT, CWC, BTWC and CTBT**
- **Nuclear Weapons Free Zones**

## **NATO**

- **NATO assessment of WMD proliferation threats**
- **Dimensions of NATO nonproliferation policy**
  - ◆ **Political and diplomatic efforts**
  - ◆ **Public policy**
  - ◆ **Common position at other fora**
- **NBC defense initiatives in NATO**
  - ◆ **Prague Capabilities Commitments**
  - ◆ **NATO Response Force**
- **Cooperation with Partners**

## **European Union**

- **WMD nonproliferation as permanent part of EU CFSP and CSDP**
- **New attention on WMD nonproliferation after 9/11**
- **Main areas of efforts**
  - ◆ **Diplomacy**
  - ◆ **Cooperative programs with partners**
  - ◆ **NBC defense (ECAP and EDA)**
  - ◆ **Common positions at other fora**
- **Similarities and differences between NATO and EU nonproliferation activities**

## **Multilateral mechanisms of nonproliferation**

- **Australian Group**
- **Nuclear Suppliers Group**
- **Missile Technology Control Regime and HCOC**
- **Global Partnership Initiative**
- **Proliferation Security Initiative**

# CBRN CRISIS MANAGEMENT

Paweł Durys  
Defence Policy Department  
Ministry of National Defence

## Objectives

- Define and discuss issue of crisis
- Describe crisis management
- Linkage between CBRN issues and crisis management
- Explore NATO and EU crisis management systems
- Civilian and military dimension

## Agenda

- What is a crisis
- Managing a crisis
- Vulnerability to CBRN attack
- NATO and crisis management
- European Union and crisis management
- Civil emergency planning
- Defence-related response

## What is a Crisis?

- Home 'here' or home 'there'
- Physical or emotional
- May involve an Individual or many
- Death or serious illness
- Natural disaster
- Civil unrest
- Monetary
- Health concerns
- CBRN attack

## Definitions

- No generally agreed definition of crisis
- One possible definition: *"A national or international situation where there is a threat to priority values, interests or goals"*
- Another possible definition: *"Organisations, arrangements and measures to control and shape the future course of a crisis"*

## Managing a Crisis

- Our definition: *"The ability to prevent, manage or resolve events which may have the potential to damage your national interests through the exploitation of smooth and efficient inter-agency management procedures"*

## What are the Warning Signals?

- Surprise
- Insufficient information
- Escalating events
- Loss of control
- Increased outside scrutiny
- Siege mentality
- Panic

## Planning for a Crisis

- For each potentially impacted audience, define the risk
- For each risk defined, describe the actions that mitigate the risk
- Identify the cause of the risk
- Demonstrate responsible management action

## Goals of Crisis Management

- Terminate the crisis quickly
- Limit the damage
- Restore credibility

## CBRN Crisis Management

- Protection / defence against chemical, biological, radiological and nuclear agents
  - Assessing the threat
  - Preventing an event
  - Protection against an event
  - Respond to an event
  - Recovering from an event

## The Nature of Problem

- General or specific
- Who makes the assessment of the problem
- Who coordinates the input into this process
- What actors should be involved
- Internal and external threats (crises)
- The scale and diversity of the threats (crises)

## The Nature of the Response

- The creation of crisis management concept / system
  - Organisation
  - Staffing
  - Equipment and work place requirement
  - Procedures
  - Implementation
  - Testing and Refinement

## Civilian Vulnerability to WMD

- Sarin nerve gas attack in Tokyo subway, 20 March 1995
- Chaos and disruption at the heart of the city
- 3800 victims (11 deaths)
- Aum Shinrikyo tried to use biological agents, including anthrax, 9 times
- Individually we can be prepared
- Collectively we will not prepared

## NATO and Crisis Management

- NATO has adopted tools to cope with crises
  - Conflict prevention / isolation of conflict
  - Humanitarian operations
- Political and military cooperation across Europe
- New strategy and structures / institutions
  - Partnership for Peace
  - Euro-Atlantic Disaster Response Coordination Centre

## Key Crisis Management Principles

- NAC highest authority
- Consensus
- Permanent Representatives represent all elements of governments
- Political control of the military at all times
- NAC functions
  - Exchange of intelligence, information and other data
  - Compare views
  - Harmonize views in collective decisions on action to be taken

## Key Crisis Management Committees

- Policy Coordination Group (PCG) provides political / military advice, coordinates NCRS
- Political Committee (PC) advises on political developments and options, including PI
- Military Committee (MC) advises NAC / DPC on conduct of military affairs
- AC/46 Special Committee advises on security intelligence
- Senior Civil Emergency Planning Committee (SCEPC) ensures civil preparedness and monitors EADRCC
- Other Committees as directed by NAC

## Other NATO Bodies

- Situation Centre
  - Receipt, collation and dissemination of political, economic and military intelligence and information
  - Facilities for briefings and staffs, but not an Operations Centre
  - 7 day / 24 hour 'point of contact'
- Crisis Management Task Force
  - Multi-disciplinary, internationally staffed coordination task force(s) – CMTF
  - Provides advice to Secretary General, Chairmen Military and other Committees, and coordinates recommendations to the NAC / DPC and through key crisis management committees

## NATO Crisis Management Process

- Phase 1: Indications and Warning
- Phase 2: Assessment
- Phase 3: Response Options, SMA, NAC Initiating Directive
- Phase 4: Planning and Execution
- Phase 5: Return to Stability

## Role of the COEC

- Develop crisis management procedures and arrangements for NATO HQ and the Alliance as a whole
- Oversee the development and updating of preventive, precautionary and crisis response options / measures
- Oversee the scheduling and planning of crisis management exercises and other crisis management events
- Provide a forum for exchanges of view with Partner for Peace and Mediterranean Dialogue nations
- Oversee the operations of the NATO HQ Situation Centre
- Provide forum for consultations with Partners

## EU and Crisis Management

- Comprehensive Planning
- Mixture of instrument and actors
- Civil-Military Coordinated approach to crisis management
- EU Crisis Management Procedures

## Main Actors

- Committees: PSC, EUMC, CIVCOM, Committee of Contributors, Athena Special Committee
- Working Groups: RELEX, PMG
- Structures / institutions: Council General Secretariat including the EUMS, Commission
- *Sui generis* entities: Crisis Response Coordination Team (CRCT)

## Main Decisions

- EU action considered appropriate (PSC)
- Approval of the Crisis Management Concept (Council)
- Decision to take action (Council)
- Approval of the Concept of Operations (Council)
- Approval of the Operation Plan (Council)
- Decision to launch the operation (Council)

## EU Crisis Management Process

- Detection of the crises and analysis of the situation
- Consideration that EU action is appropriate
  - Development of the Crises Management Concept
    - General endstate
    - Key and interim objectives
    - Delivery of key objectives
    - Measuring success
- Presentation
- Operation review

## Civil Dimension

- WMD use against civilian populations
  - Low probability *versus* high consequence threat
- Is this only a national responsibility?
  - National legal and organizational differences
- SCEPC has the primary role
  - Defence has supporting responsibilities
- Some collective response is needed
  - Build on EADRCC, CMX, and other capabilities

## Civil Emergency Action Plan

- Inventory
- Common training
- Extensive use of Euro-Atlantic Disaster Response Coordination Cell (EADRCC)
- Strong SCEPC role

## EADRCC

- The background of the EADRCC
  - The EADRCC was inaugurated on 3 June 1998
- The basic principles and the functions
  - Involvement in CBRN
  - CBR inventory
- Operations of the EADRCC
- Training and Exercise
  - „Bodgorodsk 2002” and „Dacia 2003”

## Possible Defence Contributions

- Information sharing and warning
  - Establish database to identify key experts and assets
- Greater research collaboration
  - e.g., chemical and biological agents detection and identification
- Consequence Management
  - Relief capabilities to assist civil authorities
  - Cooperative civil-military planning
  - Conduct civil and military training and exercises
  - Protection, medical treatment

## NBC Defence Deliverables (I)

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>● Deployable NBC Analytical Laboratory<ul style="list-style-type: none"><li>- Quickly and easily transportable into theatre</li><li>- Investigate and collect samples of possible NBC contamination</li><li>- Conduct highly reliable scientific analysis of samples</li></ul></li></ul> | <ul style="list-style-type: none"><li>● Joint Assessment Team<ul style="list-style-type: none"><li>- Assess the effects of an NBC event</li><li>- Advise NATO Commanders on mitigating effects of an NBC event</li><li>- Enable NATO Commanders to 'reach-back' to national experts for technical advice</li></ul></li></ul> |
|--|--|

## NBC Defence Deliverables (II)

- Virtual Centre of Excellence for NBC Weapons Defence
  - Enhance Senior-level NBC education
  - Improve operational understanding of NBC defence
  - Expand and strengthen NBC defence training
- Medical Stockpile Initiative
  - Identify and share national stockpiles
  - Rapidly move needed defence materiel into theatre
  - Improve medical treatment protocols

## NBC Defence Deliverables (III)

- Disease Surveillance System
  - Collect info on unusual disease outbreaks
  - Alert NATO Commander of a biological outbreak
  - Fuse data with other information sources
- NATO Multinational CBRN Defence Battalion
  - Unique spectrum of capabilities
  - Fully operational capability by 1 June 2004
  - Compatible with the NATO Response Force

## Conclusions

- Crucial role of crisis management in a modern world
- Crisis management systems / procedures as a toolbox, to be used flexibly
- Need to tailor them to each specific case, e.g. CBRN protection
- Necessary complementarities with other actors (NATO, EU, UN) or national decision-making procedures



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## **WEAPON OF MASS DESTRUCTION**

**WARSAW**



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### **AIM**

- **provide an information about the characteristics and effects of nuclear, radiological, biological and chemical agents**
- **understand the treat posed by CBRN agents and describe how defence against all agents should be performed**



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**AGENDA**

- Nuclear, radiological agents /weapon/
- Biological agents /weapon/
- Chemical agents /weapon/

Base on

BACWORTH ENCYCLOPEDIA

(Textbook of Military Medicine: Part I-Warfare, Weaponry, and the Casualty. Medical Aspects of Chemical and Biological Warfare. Sidell, Takafuji, Franz (Editors) The Broden Institute. Washington DC. Walter Reed Army Medical Center, June 1, 1997

JANE'S CHEM-BIO HANDBOOK

JANE'S NBC DEFENCE 2005-2006

ALLIED JOINT DOCTRINE FOR NBC DEFENCE (AJP 3 8) (STANAG 2451)

BRON CHEMICZNA - Krauze - Nowak - MON 1985

BRON JADROWA - OGOLNA CIARAKTERYSTYKA I DZIALANIE Rogalska Marian 1985



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≈ **CBRN Weapon.** *A fully engineered assembly designed for employment by the armed forces of a nation state to generate a nuclear detonation or to cause the release of a chemical or biological agent or radiological material onto a chosen target.*

*(proposal to AAP - 21)*



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***Toxic Industrial Material (TIM)***

*A generic term for toxic or radioactive substances in solid, liquid, aerosolised or gaseous form. These 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).*



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**NUCLEAR WEAPON**

**A complete assembly (i.e. implosion type, gun type or thermonuclear type) in its intended ultimate configuration which, upon completion of the prescribed arming, fusing and firing sequence, is capable of producing the intended nuclear reaction and release of energy. (AAP-6)**



**RADIOLOGICAL WEAPON**

**Any device, including a weapon or equipment other designed to employ radioactive material by disseminating means of the radiation produced by the decay of such *radiation weapon or radiation dispersal device*. (AAP-6)**



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### ALTITUDE

- high altitude
  - air
  - ground (water)
  - underground (underwater)
- high altitude bursts (exo-atmospheric)
  - airbursts (endo-atmospheric)
  - surface bursts
  - sub-surface bursts (underground and underwater)



### YIELDS

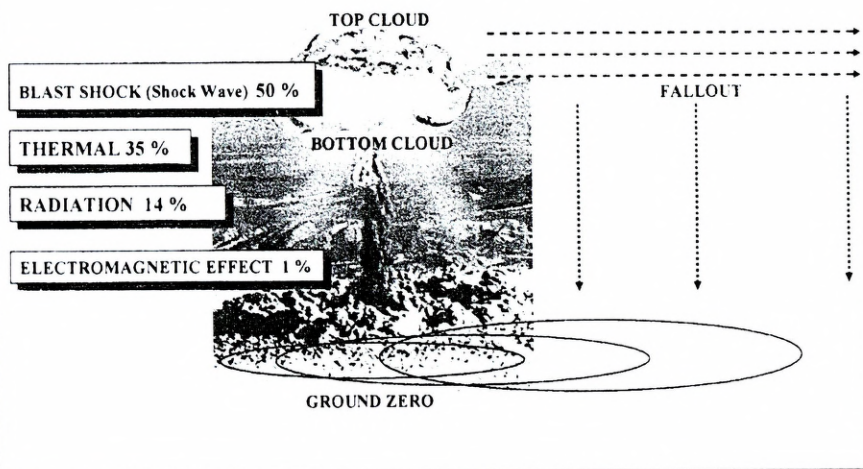
- very low ( $y < 1$  kt)
- low ( $1 < y < 10$  kt)
- medium ( $10 < y < 50$  kt)
- high ( $50 < y < 500$  kt)
- very high ( $y > 500$  kt)



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### EFFECTS OF NUCLEAR DETONATION

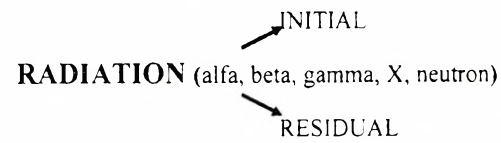
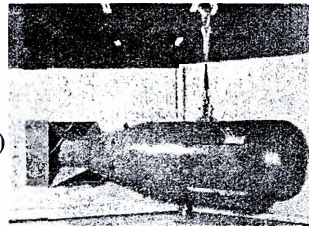
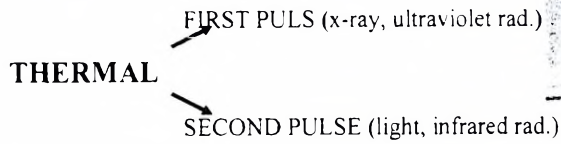




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**BLAST and SHOCK – Mach Effect**



**ELECTROMAGNETIC EFFECT**



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**OVERVIEW EFFECTS**

	AIR BURST		SURFACE BURST	SUB-SURFACE BURST
	HIGH	LOW		
BLAST	WEAK	Y	Y	WEAK
SHOCK	N	N	WEAK	Y
HEAT	Y	Y	Y	N
INITIAL RADIATION	WEAK	Y	Y	N
INDUCED RADIATION	WEAK	Y	Y	Y
FALLOUT	N	N	Y	Y



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☛ What is the biological agent?

A micro-organism or toxin which causes disease in man, plants, or animals or causes deterioration of material

AAP-21- NATO GLOSSARY OF NBC TERMS AND DEFINITIONS – STANAG 2367

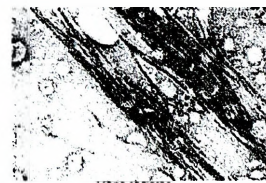


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**BIOLOGICAL AGENTS - GENERAL CHARACTERISTICS**

- ☛ Capable of being stockpile
- ☛ Simple to produce
- ☛ Capable of delivery by a variety of means
- ☛ Stable in aerosol state
- ☛ Difficult to detect
- ☛ Ineffective in small doses
- ☛ Short incubation period





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**ROUTES OF ENTRY**

- Respiratory Tract
- Digestive Tract (Oral Route)
- Skin



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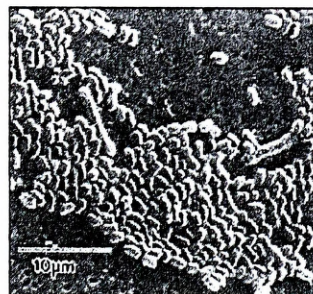


**Biological agents**

**Pathogens**

- *Bacteria*
- *Virus*
- *Rickettsia*
- *Fungi*

**Toxins**





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### Pathogens

#### **Bacteria** (and Resultant Diseases)

*Bacillus anthracis* (anthrax)  
*Brucella suis*, *Brucella melitensis* (brucellosis)  
*Clostridium perfringens* (gas gangrene)  
*Campylobacter jejuni* (diarrhea)  
*Corynebacterium diphtheriae* (diphtheria)  
*Pseudomonas alhoprecipitans* (corn blight)  
*Erwinia carotonova* *Escherichia coli* (diarrhea)  
*Francisella tularensis* (rabbit fever, tularemia)  
*Neisseria meningitidis* (meningitis)  
*Pseudomonas pseudomallei* (melioidosis)  
*Salmonella typhi* (typhoid fever)  
*Shigella dysenteriae* (dysentery)  
*Staphylococcus aureus* *Vibrio cholerae* (cholera)  
*Xanthomonas oryzae* (rice blight)  
*Xanthomonas vascularum* (sugar cane wilt)  
*Yersinia pestis* (plague, bubonic/pneumonic)  
AND MANY OTHERS

#### **Virus** (and Resultant Diseases)

*Influenza virus*  
*Hepatitis A virus* *Newcastle disease virus*  
*Pestivirus* (hog cholera, European swine fever)  
*Rabies virus* *Rinderpest virus* *Swine fever virus*  
*Tobacco mosaic virus* *Variola virus* (smallpox)  
AND MANY OTHERS

#### **Rickettsia** (and Resultant Diseases)

*Coxiella burnetii* (Q fever)  
*Rickettsia mooseri*, (endemic typhus, flea-borne typhus)  
*Rickettsia prowazekii*, (epidemic typhus, louse-borne typhus, spotted typhus)  
*Rickettsia rickettsii* (Rocky Mountain spotted fever)  
AND MANY OTHERS



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### Toxins

*Abrin* (proteinaceous plant toxin)  
*Botulinum toxin* (produced by *Clostridium botulinum*)  
*Staphylococcal enterotoxin A (SEA)* (bacterial toxin)  
*Aflatoxins*  
*Batrachotoxin*



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**Protection measures**

- realistic training
- prophylactic inoculation
- good hygiene
- physical conditioning personnel
- contamination avoidance
- warning, detection and identification



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• What is the chemical agent?

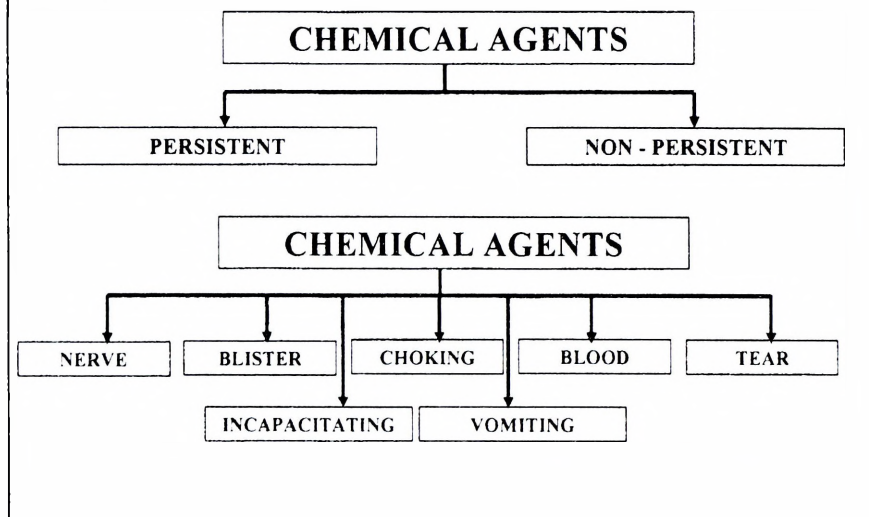
A chemical substance which is intended for use in military operations to kill, seriously injure, or incapacitate man through its physiological effects.

The term excludes riot control agents when used for law enforcement purposes, herbicides, smoke and flames.

AAP-21. NATO GLOSSARY OF NBC TERMS AND DEFINITIONS - STANAG 2367



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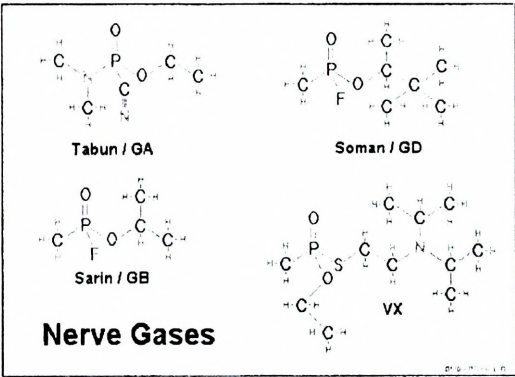


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**Nerve agents**

**G-series**  
GA, GB, GD, GF,  
**V-series**  
VE, VG, GM, VS, VX





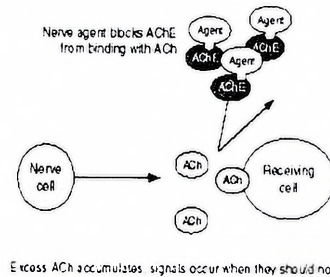
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## Nerve agents

### Poisoning symptoms

- Running nose
- Tightness in chest
- Dimness of vision and myosis
- Drooling and excessive sweating
- Vomiting, cramps, involuntary defecation and urination
- Headache and convulsions
- Cessation and breathing
- death



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## Nerve Agents

### Terrorist Attacks

GB released in 1994 Matsumoto (Japan)

GB released in 1995 Tokyo (Japan)



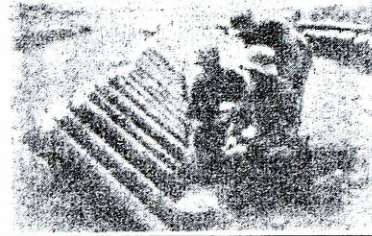
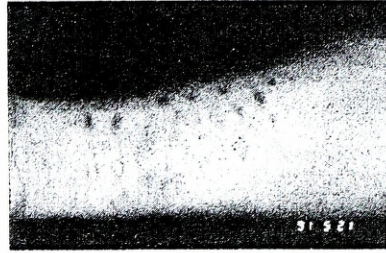


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## **Blister**

- H (Levinstein mustard)
- HD (sulfur mustard)
- HN-1, HN-2, HN-3 (nitrogen mustards)
- CX (phosgene oxime)
- PD (phenyldichloroarsine)
- MD (methylchloroarsine)
- L (Lewisite)



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## **Choking**

- DP (diphosgene)
- Cl (chlorine)
- CG (phosgene)

## **Blood**

- SA (arsine)
- AC (hydrogen cyanide)
- CK (cyanogen chloride)



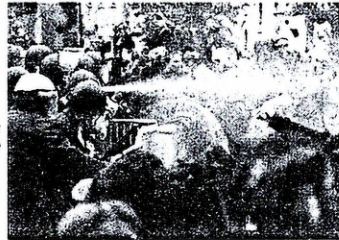


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### Tearing

CN (chloracetophenone)  
CS (ortho-chlorobenzylidene malononitrile)  
PS (chloropicrin)  
CA (bromobenzyl cyanide)  
CR (dibenzoxazepine)



### Incapacitating

BZ (3-quinuclidinyl benzilate)  
LSD (lysergic acid diethylamide)

### Vomiting

DM (adamsite)  
DA (diphenylchloroarsine)  
DC (diphenylcyanoarsine)

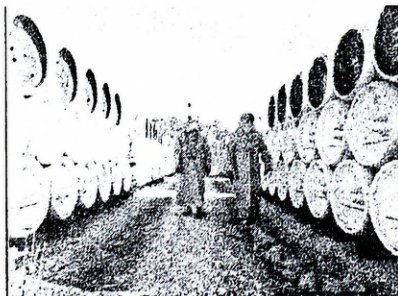


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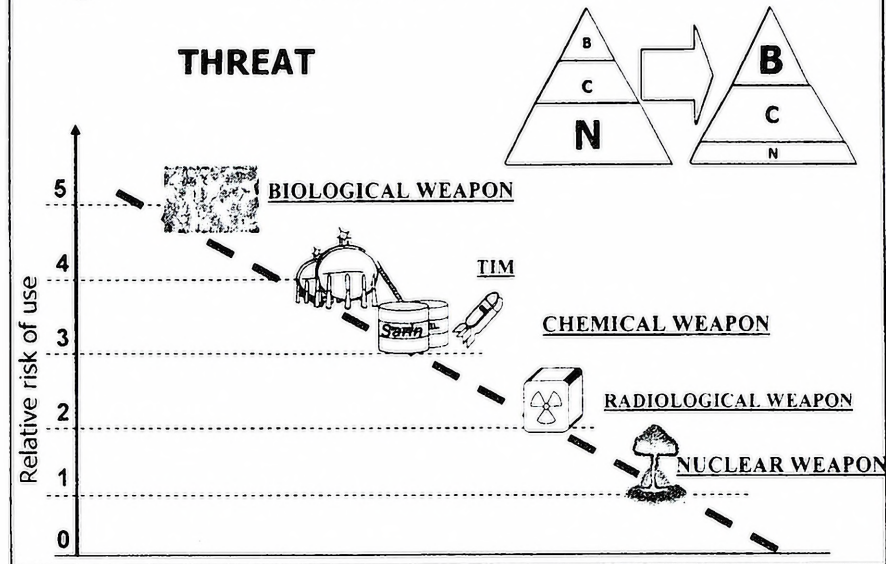
### Defence measures against chemical weapons

- **protection** (detection, identification, W&R)
- **decontamination** (immediate, operational, thorough, clearance)
- **avoidance**





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Maj Martin Kloske Ph. D.  
NBC Area Control Centre Poland

# The NBC Detection Identification & Monitoring



Maj Martin Kloske Ph. D.  
NBC Area Control Centre Poland

**Thesis:**

- **Radiological Detection, Identification & Monitoring**
- **Biological Detection, Identification & Monitoring**
- **Chemical Detection, Identification & Monitoring**



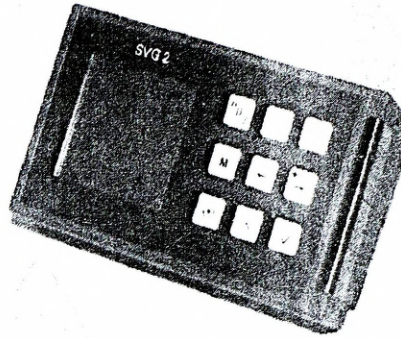
## SVG 2

Nuclear Radiation Detection

Stratix

### The new generation of nuclear radiation detectors

Hand-held, hardened micro-processor controlled radiation detector, based on state-of-the-art semiconductor technology. Equipped with integrated sensors for gamma and neutron radiation detection, an external personal dosimeter, and an external  $\alpha/\beta$ - $\gamma$  probe. A broad range for  $\gamma$ -dose rate is covered (10 nGy/h - 20 Gy/h).

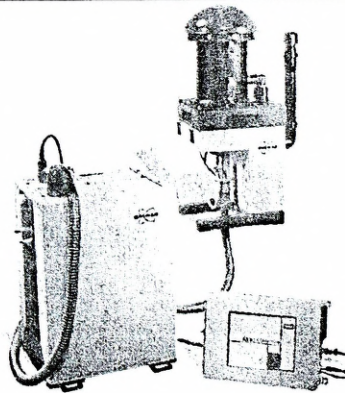


## CBMS

Biological Warfare Agent Detector

### The Chemical Biological Mass Spectrometer

Military ruggedized mobile Ion-Trap Mass Spectrometer for the identification of CWAs and classification of BWAs. The CBMS, equipped with Virtual Impactor and Pyrolyzer, is capable of detecting and classifying BWAs within 3 minutes. The system is used in the US Army P<sup>3</sup>I Biological Integrated Detection System.



## RAID

Chemical Warfare Agent Detection

### Rapid Alarm and Identification Devices for CWAs Detection

Hand-held and portable chemical agent detectors with automatic alarm function applicable for personnel protection and for CWA monitoring. The devices can be operated under field conditions, on vehicles, ships and in shelters. A mounted version, the RAID-S, is designed as trace gas detector for long term operations.

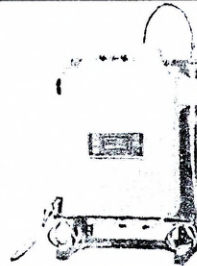
RAID-1



RAID-M<sub>onitor</sub>



RAID-S

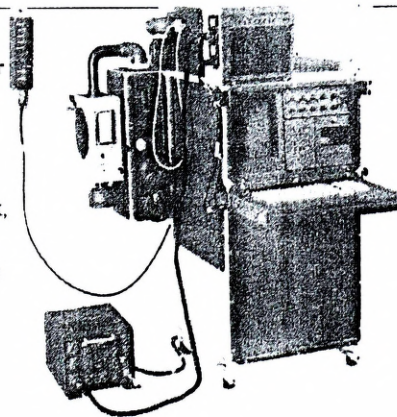


## MM 1

Chemical Warfare Agent Detection

### Mobile Mass Spectrometer for reconnaissance vehicles

An extremely rugged and field-proven GC/MS system for CWA detection, key component of the NBCKS FOX (US, UK, Germany and Saudi Arabia), the French VAB RECO and the South Korean K216 and K316 NBCRS. More than 450 systems have been delivered.

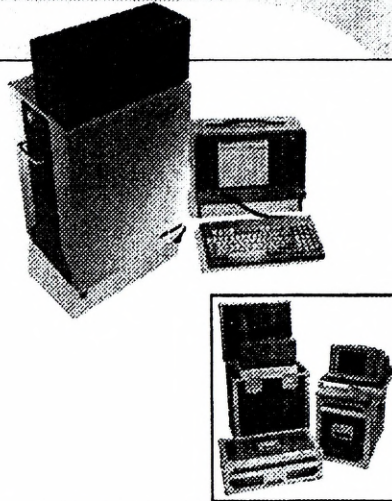


## EM 640S

Chemical Warfare Agent Detection

### Mobile Mass Spectrometer for detection of chemical hazards

Mobile mass spectrometer for the fast on-site detection of hazardous compounds and CWAs from air, soil and liquids. The EM 640 has proven its reliability under harsh conditions and is working in the OPCW's inspection task under the Chemical Weapons Convention.

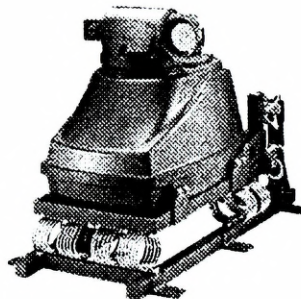


## RAPID

Chemical Warfare Agent Detection

### Stand-off detector for atmospheric pollutants

A mobile Fourier Transform Infrared detection system for real-time remote sensing of toxic industrial compounds and chemical warfare agents. The instrument registers the natural infrared radiation signature of chemical agents.

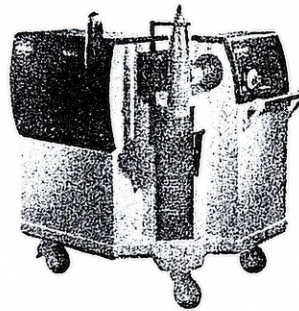


## NIGAS

11/01/2000

### Non-destructive identification of explosives and CWAs

System for automated, non-destructive detection of explosives and chemical warfare agents in ammunition, using Neutron Activation Analysis with a non-radioactive source. The instrument is transportable and can be used even under field conditions.



cpt. Radosław SZMIGIELSKI

## Physical Protection

### Individual Protection ATP-59

**Each soldier should be equipped with: respiratory protection equipment (gas mask, filter canister), medical equipment (disposable syringe, barrier creams), decontamination kit, first aid kit and protective clothing (suit, gloves, boots) for protection against chemical, biological and radiological threats and where it is possible against toxic industrial materials. Commanders have to know the limitation of use the physical protection equipment. Especially limitation of use respiratory protection devices - it is connected with possibility of canister ignition (in some cases - for example: large concentration of hydrogen sulfide) or with insufficient oxygen concentration - due to high level of contamination.**

## **INDIVIDUAL PROTECTION EQUIPMENT**

### **Cleaning respiratory protection devices**



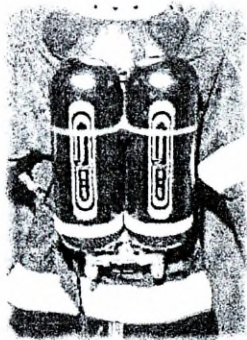
#### **Overall gas mask type MP-5:**

- **equipped with filter canister FP-5 – protection against toxic NBC gases and aerosols, limited protection against ammonia and chlorine**
- **possibility of use industrial canisters (ABEK);**
- **one exhalation valve;**
- **good sealing with protective suit;**
- **high level of air flow resistance.**

## Compressed air breathing apparatus FSRiLG „FASER”

- Compressed air breathing apparatus is a respiratory protective device designed for work protection purposes, rescue operation, fire fighting work, on ships, used to guide endangered persons to safety from dangerous environment. Breathing apparatus is also for industrial applications. Apparatus enables the user to breathe in case of oxygen deficiency and in the presence of harmful substances at the optional concentration of ambient atmosphere unless aggressive chemicals affect destructively the unit or disturb its satisfactory operation. Breathing apparatus can be used in the temperature of ambient atmosphere within the range from -30°C to +60°C. When an accident happens and there is danger of poisonous and aggressive media such as toxic industrial agents, toxic warfare agents, radioactive substances and biological agents in all possible form as solids, liquids, aerosols and vapours, which could affect destructively the device and disturb its operation as well as poison the user through the skin, breathing apparatus should be worn together with protective gas tight suit and protective gloves.
- The apparatus does not protect the user against infection through the skin.
- The apparatus must not be used as diving apparatus.
- Parameters of breathing apparatus except mass are in compliance with PN-EN 137.

## Compressed air breathing apparatus type APS/3N-4080



### Technical data:

Duration of protection at air consumption of average 30 dm<sup>3</sup>/min

- total	130 min
- without reserved air	110 min
Number of cylinders -	2
Volume of cylinders/ diameter of cylinder-	6.8 dm <sup>3</sup> /156mm
Max. pressure in cylinder -	30 MPa
Air capacity (at normal condition)-	4080 dm <sup>3</sup>
Warning pressure	5,5 ± 0,5 MPa
Delivery of air at underpressure 1000 Pa	min. 300 dm <sup>3</sup> /min
Inhalation resistance	not more then 450 Pa
Total mass of apparatus	19,5 kg
Dimensions:	
Height x width x thickness	610 x 330 x 165mm

### Compressed air breathing apparatus type APS/3N- 2040

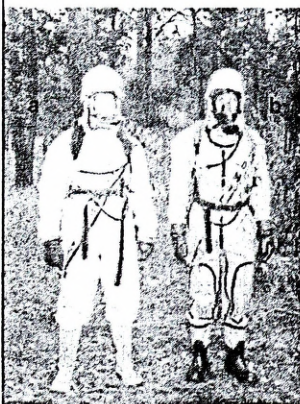


#### Technical data:

Duration of protection at air consumption of average 30 dm<sup>3</sup>/min

- total	65min
- without reserved air	55min
Number of cylinders	1
Volume of cylinders/ diameter of cylinder-	6.8 dm <sup>3</sup> /156mm
Max. Pressure of cylinder	30 MPa
Air capacity (at normal condition)	2040 dm <sup>3</sup>
Total mass of apparatus	13,4kg
Dimensions:	
Height x width x thickness	600x 280 x 156mm

### Practical solution/aplication



- Rescuer man – suit produced by „TRELLECHEM” compressed air apparatuses „INTERSPIRO”
- Rescuer man – suit produced by „MILAGRO” Grudziądz compressed air apparatuses APS-3 „FASER”

### LEKKA IZOLACYJNA ODZIEŻ OCHRONNA



**Light weight isolation suit is a part of each soldier individual equipment. It was designed for Land Forces, Navy, flying personnel, ground technical personnel. With protective gas mask it is for skin and body protection against CWA and TIM. This suit could be used by other military and civilian units - for other tasks and places. It consists of tunic with hood, trousers with boots and gloves.**

### IZOLACYJNA ODZIEŻ OCHRONNA NOWEJ GENERACJI



**Isolation suit - new generation. It is designed for special purpose for soldiers from decontamination troops and teams. They must have special equipment which allows them to work for long time in dangerous environment. This suit is equipped with blowing units with special filters for ventilating inside space. This techniques allows to avoid heat stress and for better water vapour removing.**

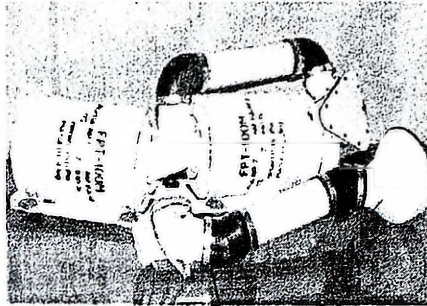
## **Collective Protection**

**Collective protection facilities - buildings, vehicles, tents are designed for keeping toxic free environment inside them. In ideal condition overpressure inside those structures is generated by air filtration unit - which can protect against all types of contamination - and in this way clean air is delivered to people. This system allows to work without IPE for unlimited period of time.**

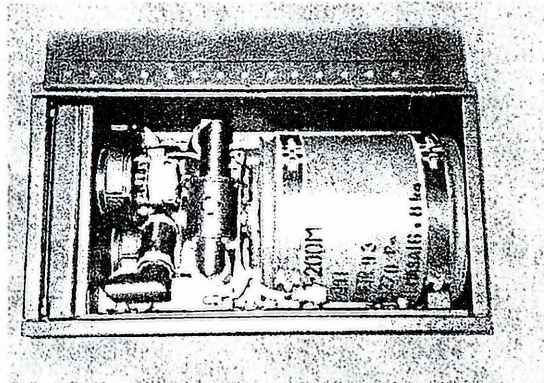
### **Aims**

- Protection of personnel inside of instalation**
- Possibility to work, rest, sleep without IPE**

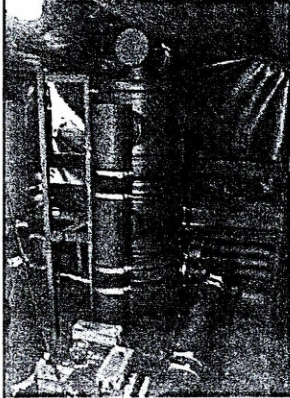
## Examples of Air Filtration Unit



**AFU UFWCz-200 for tank crew protection. Two filters FPT-100M each 100m<sup>3</sup>/h can clean air from air born aerosol with diameter above 0,3 micrometer, and from CWA in form of gases and vapors, in limited level protection against TIM's.**



**AFU for small container and vehicle cabin. One FPT-200M with air flow and overpressure regulation is sufficient for up to 10 soldiers. It is possible to achieve 500 Pascals overpressure.**



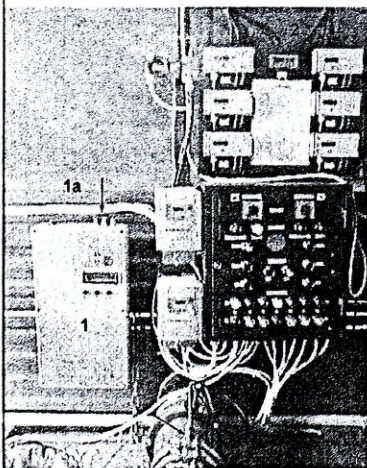
**AFU type UFW-900 for tent system**

Three stage air cleaning

I stage – wire net for fan protection can stop particles with 50  $\mu\text{m}$  diameter;

II stage – prefilter PF-1000 for aerosol with diameter above 5  $\mu\text{m}$ ;

III stage – filtercanister FP-300P with activated carbon layer and filter HEPA class.



**Devices for steering and controlling system UFW-900-2C**

1- automatic CWA and TIM's detector „ALERT-2”

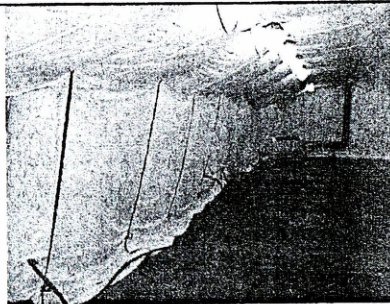
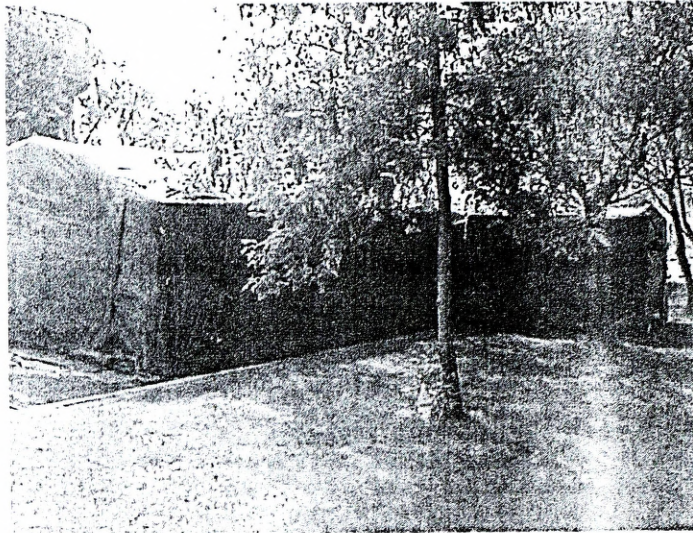
1a- outside air inlet;

1b – cleaned air probe

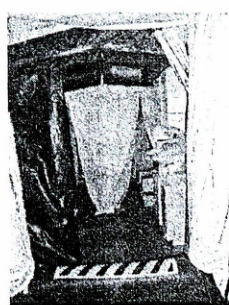
2- controlling table (air flow meters and differential manometers);

3- steering table.

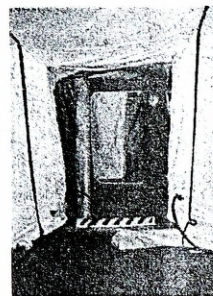
**Light, transportable COLPRO**



Inside view of tent



Sanitary chamber with equipment



Entry/Exit airlock with decon shower cabin.

## **Air Filtration Unit**

- Amount of clean/fresh air per person  
– 20 m<sup>3</sup>/h
- Number of air changes per hour – 5
  - Keep CO<sub>2</sub> concentration below 0,5%
- Generate overpressure

## **Overpressure inside facilities**

### **Minimal Overpressure In Stationary Objects**

**100 Pa**

### **Minimal Overpressure In Vehicles**

$$\Delta p = 100 + \rho/2 (v_p + v_w)^2 \text{ Pa,}$$

**$v_p$  - Vehicle speed [m/s]**

**$v_w$  - Wind speed [m/s]**

**$\rho$  - air density at sea level kg/m<sup>3</sup>,**

**$\rho/2 = 0,62$**

# NBC WARNING AND REPORTING SYSTEM OF THE POLISH ARMED FORCES

Presented by LTC J.STOCKI

WARSAW, APRIL 2006



NBC ACC, WARSAW - RADIOWA 49 - TEL. +48226956013 (DUTY SERVICE) FAX +48226956028 - POLAND  
REL TO NON-NATO MEMBER COUNTRIES



Fig. 1 One way relation

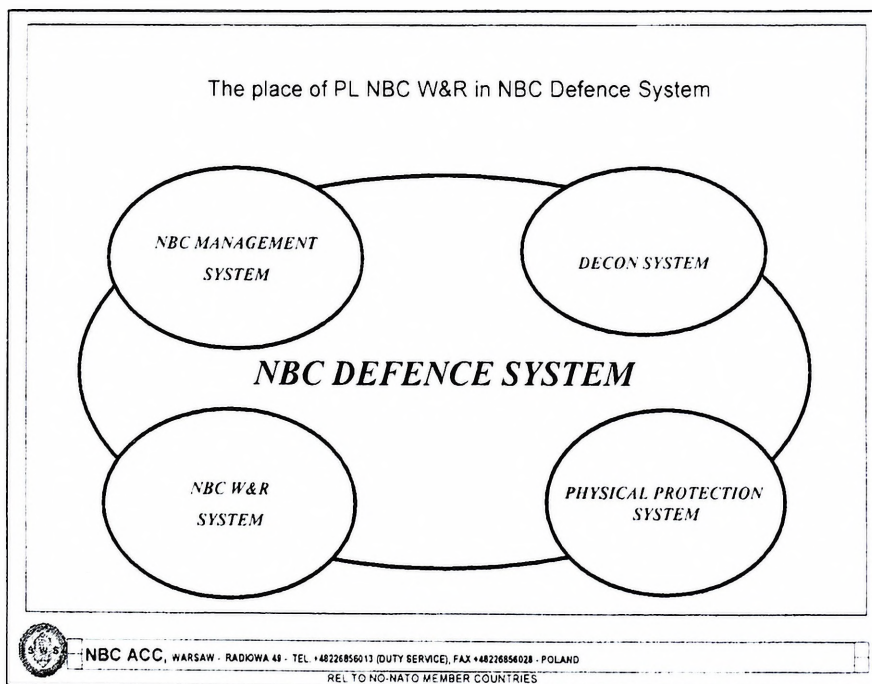
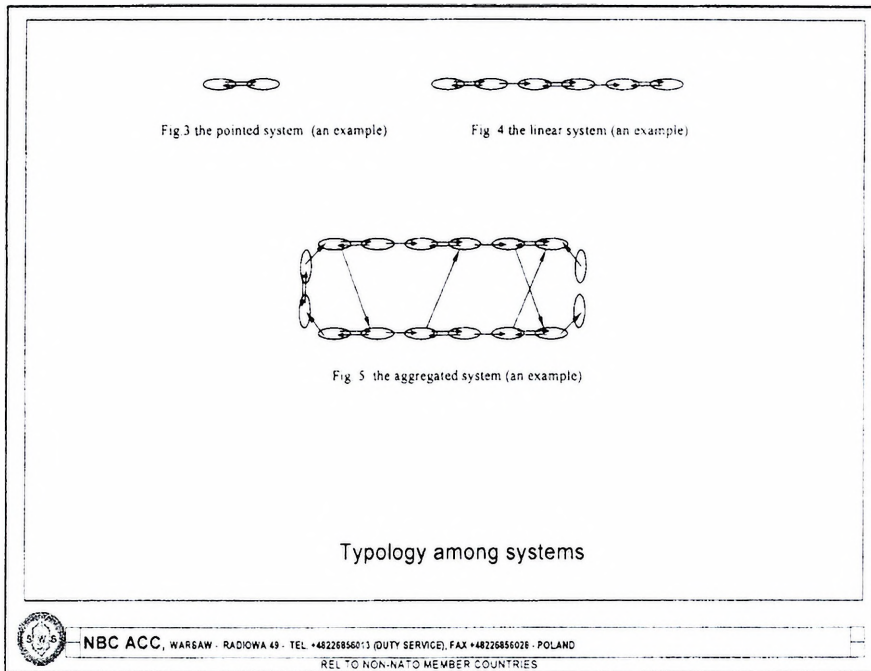


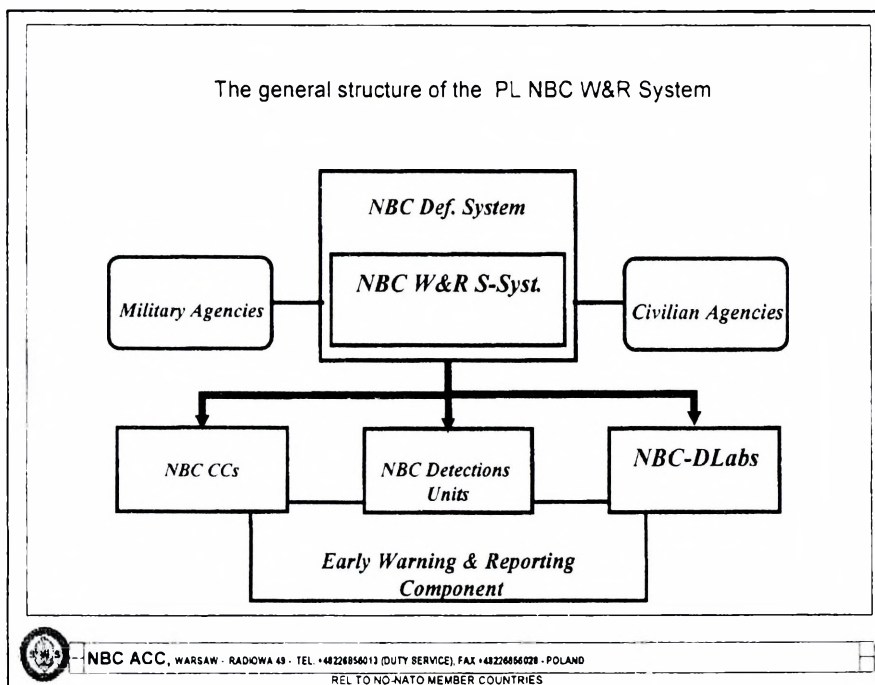
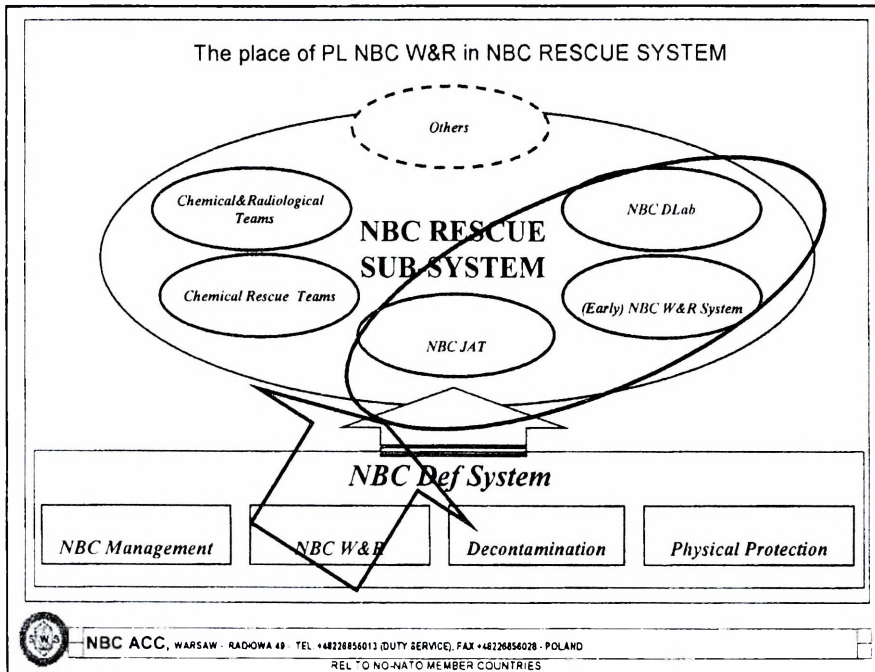
Fig. 2 a reflexive connection

The elementary relations within systems

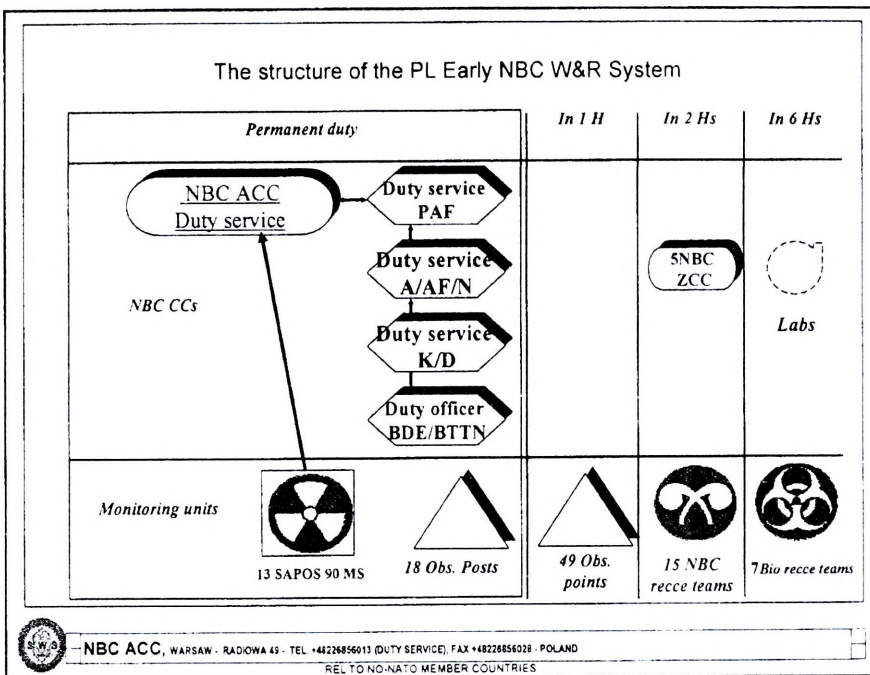


NBC ACC, WARSAW - RADIOWA 49 - TEL. +48226956013 (DUTY SERVICE) FAX +48226956028 - POLAND  
REL TO NON-NATO MEMBER COUNTRIES

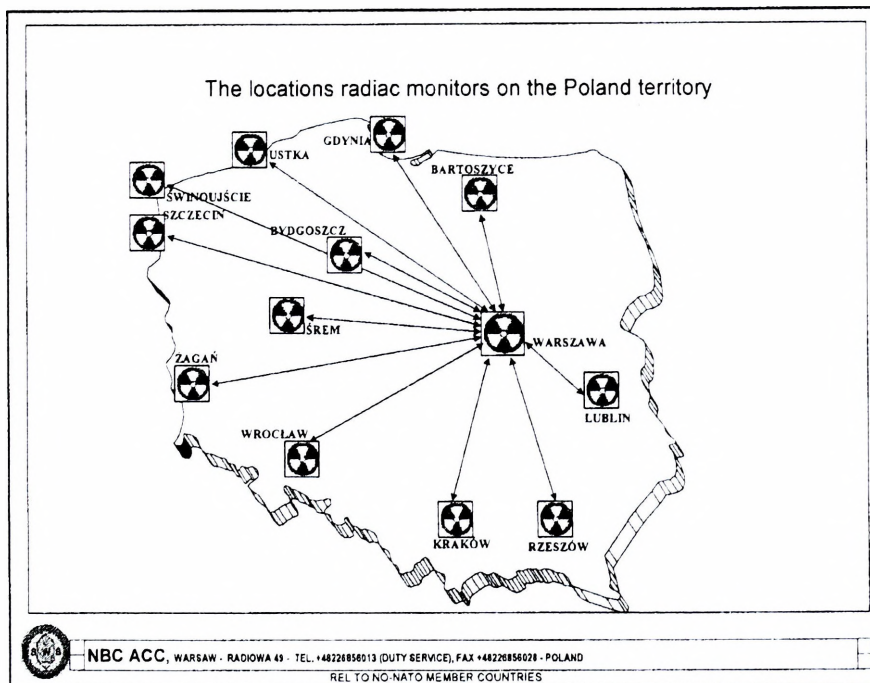


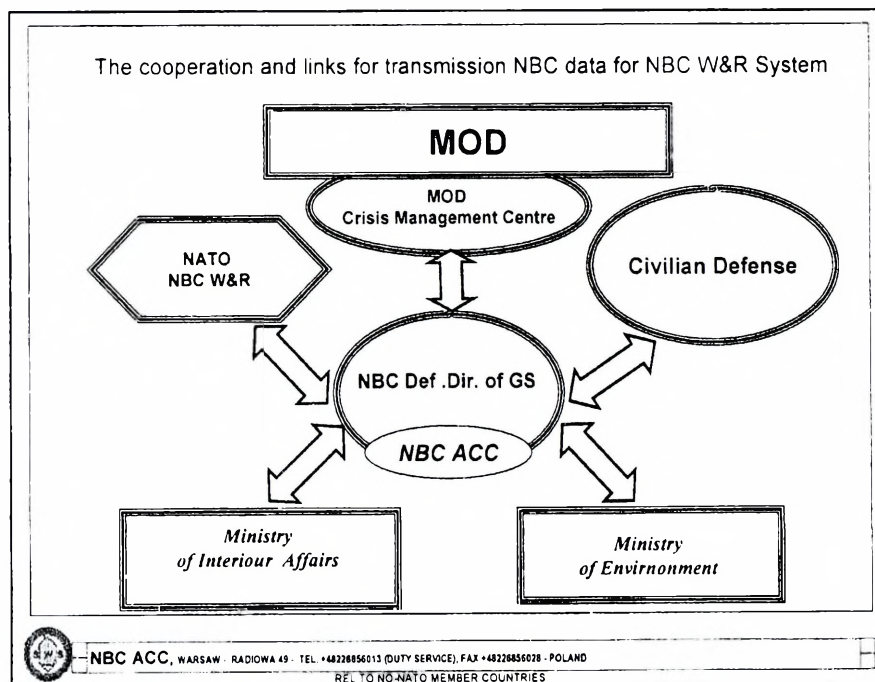
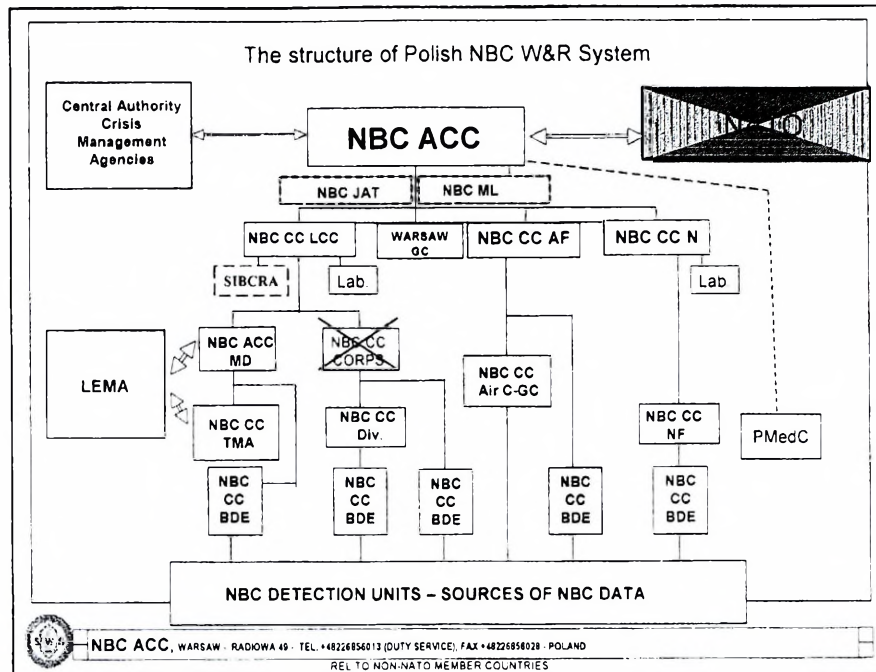


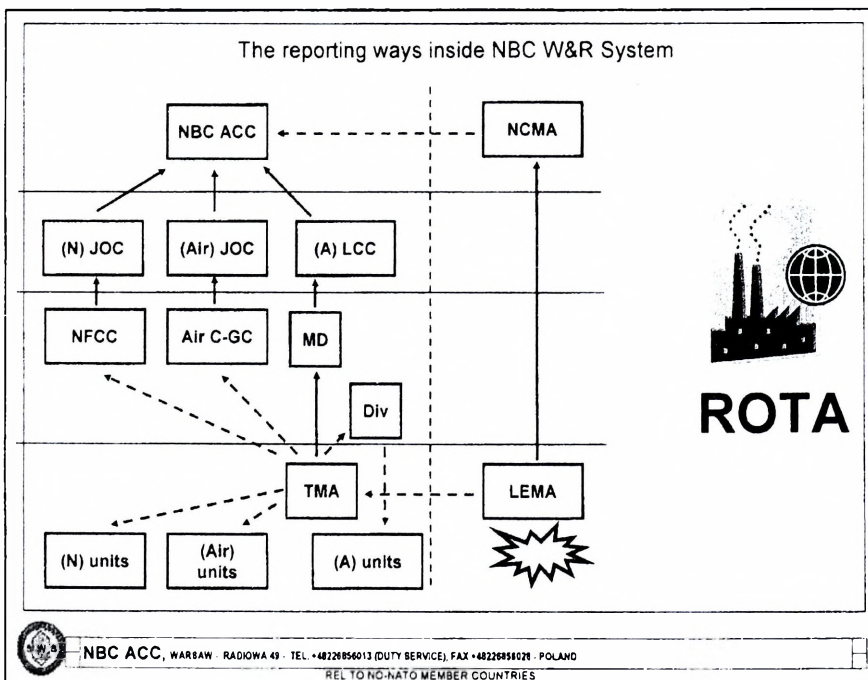
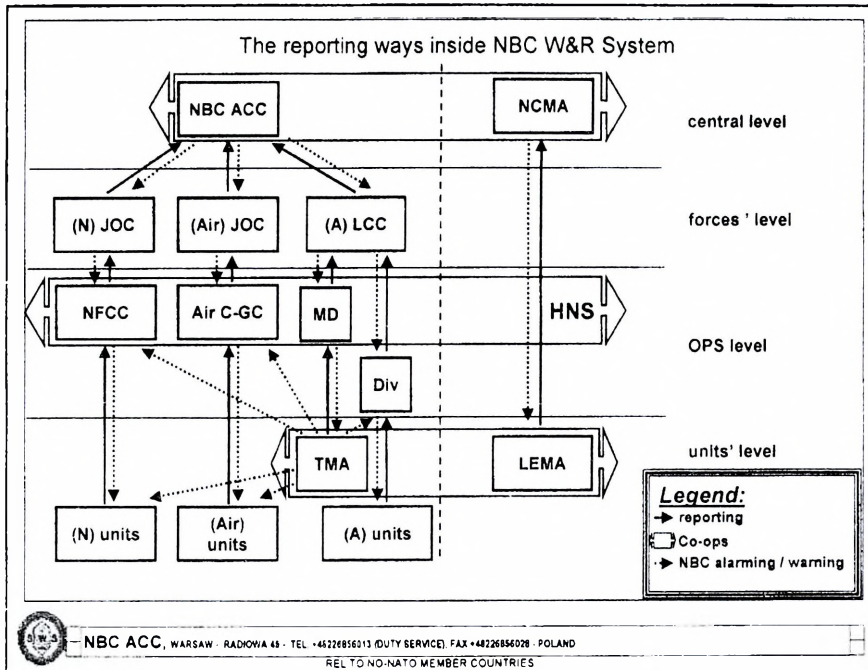
The structure of the PL Early NBC W&R System

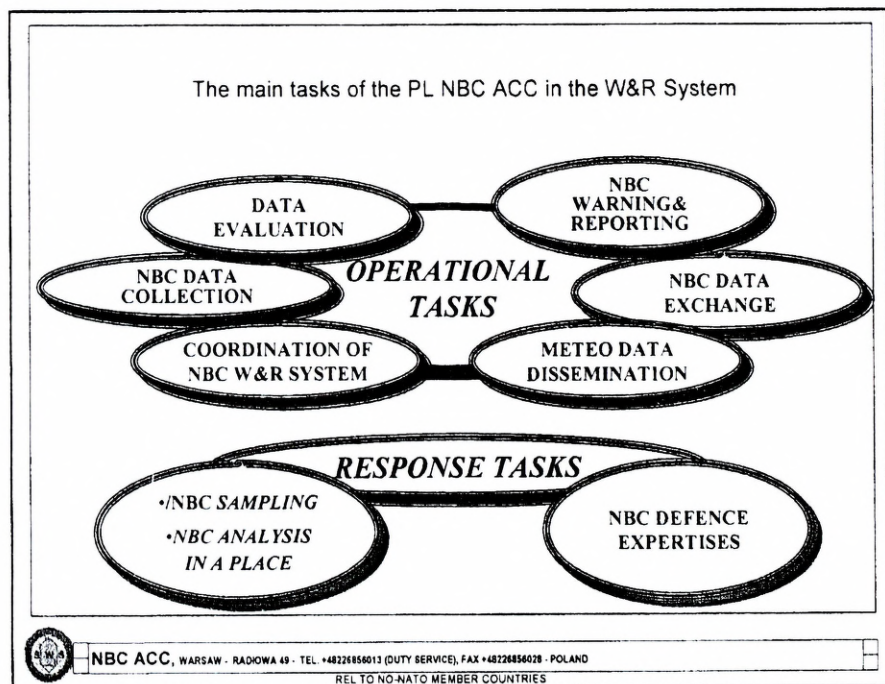
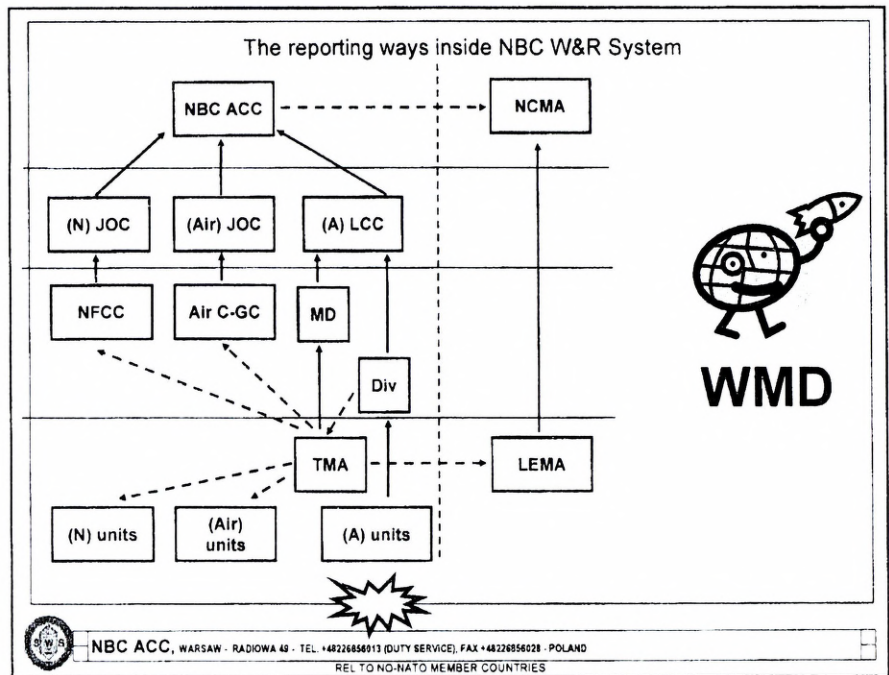


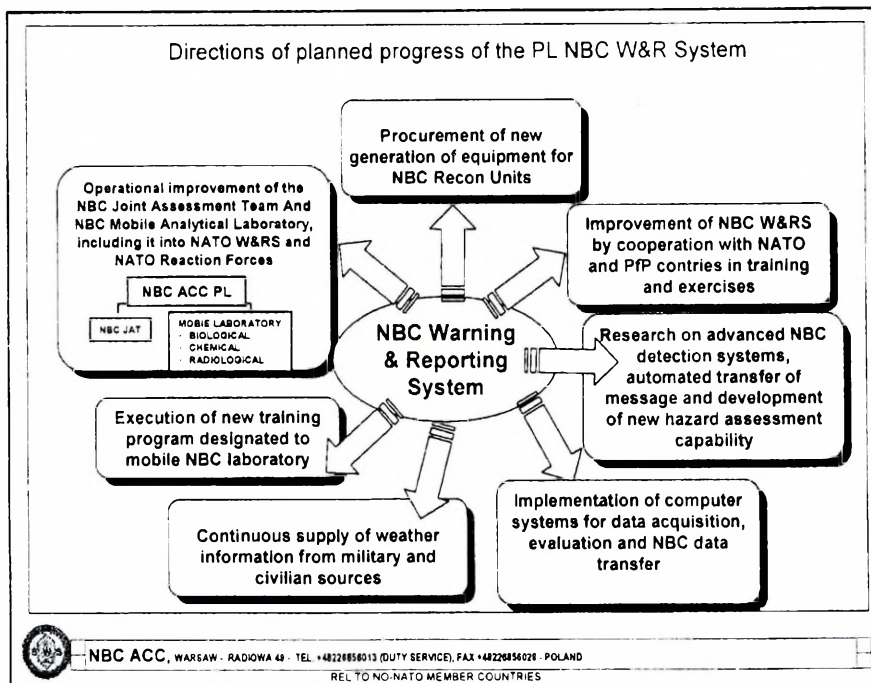
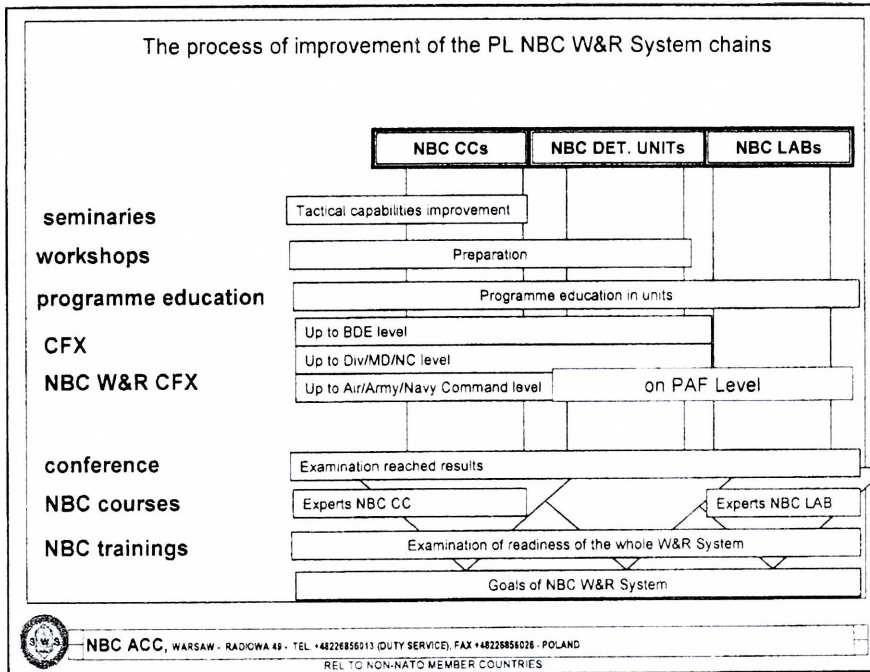
The locations radiac monitors on the Poland territory









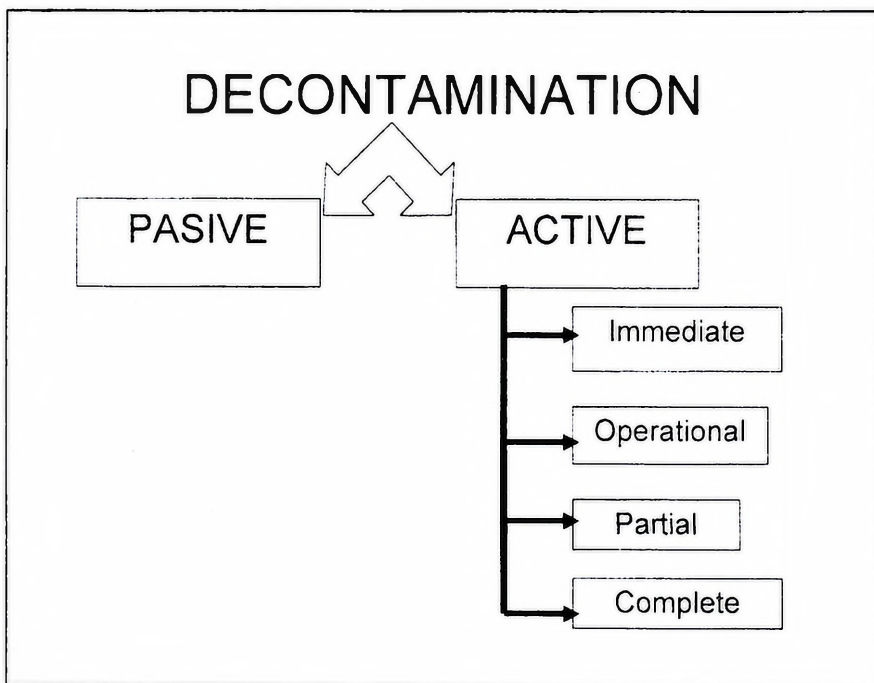
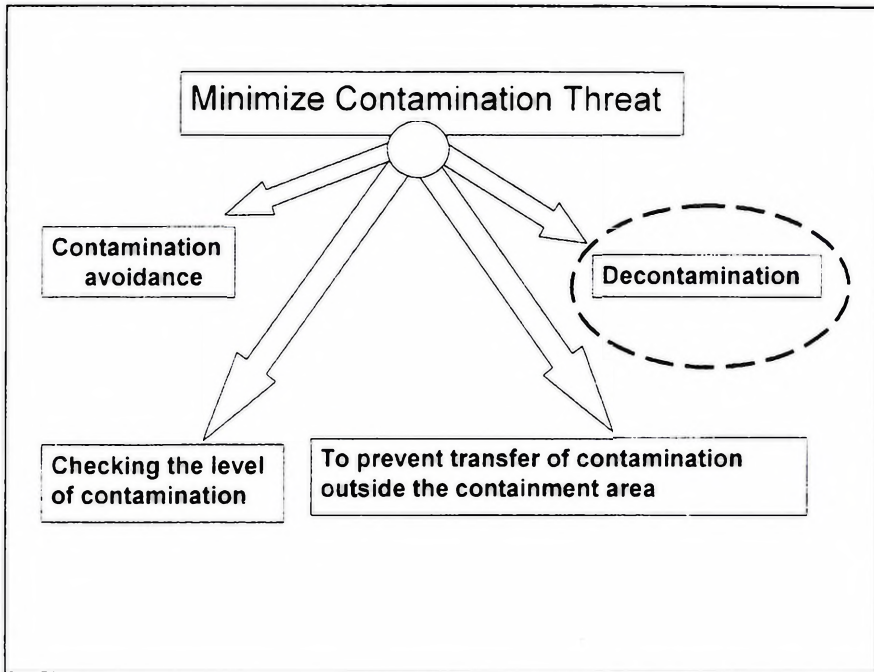


# DECONTAMINATION SYSTEM

Cpt. Jarosław ZOCHOWSKI  
Cpt. Norbert HOŁYSZ

## NBC elements

- reconnaissance, identification and monitoring of hazards;
- warning and reporting system;
- individual and collective protection;
- minimize contamination threat;
- NBC medical protection;



**Immediate decontamination.** is exactly the immediate actions taken by an individual to survive. Individuals conduct immediate decontamination using the supplies and equipment they carry /own kits/. Immediate decontamination consists of:

- Skin decontamination.
- Personal equipment wipe down.

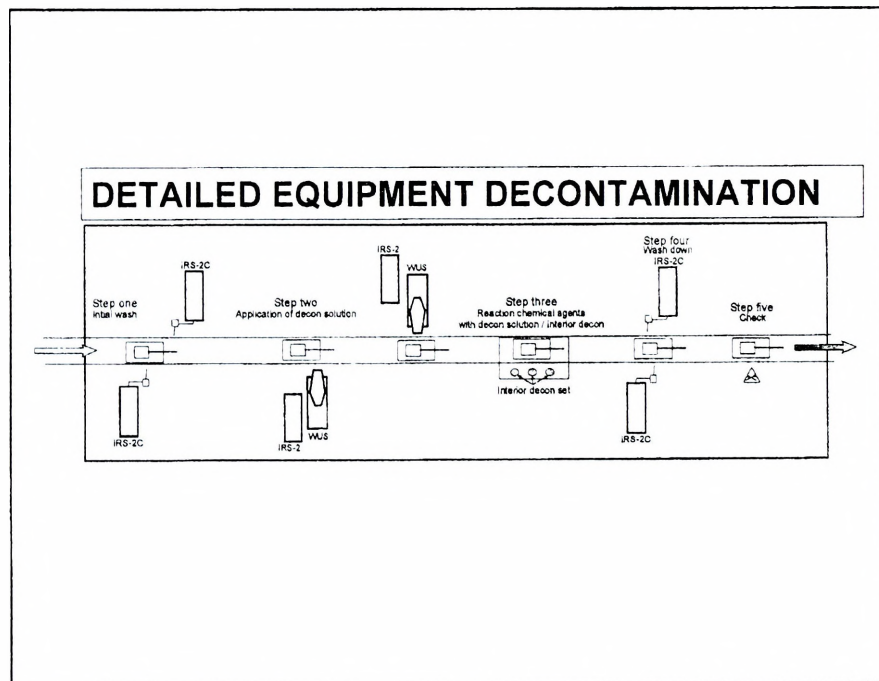
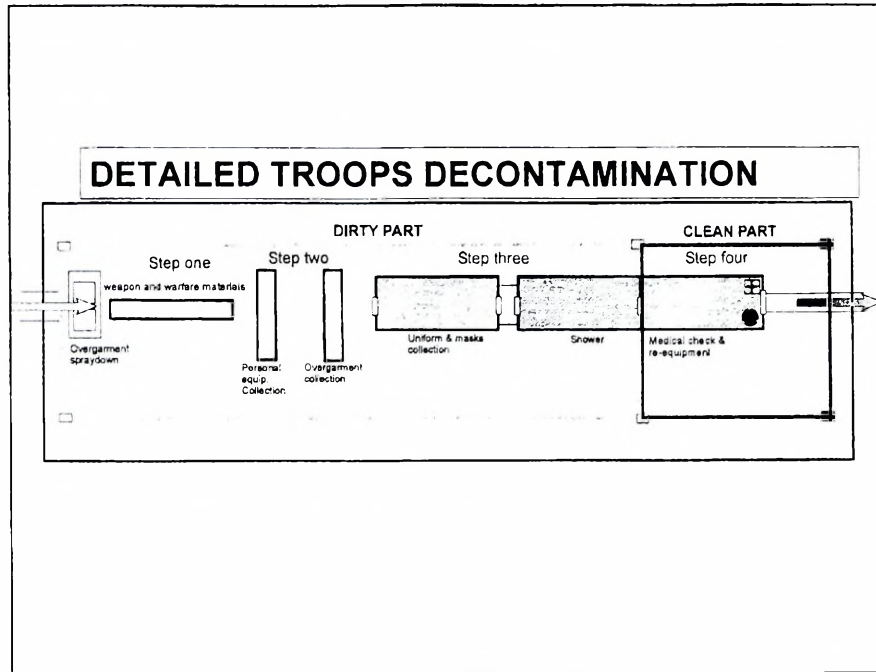
**Operational decontamination** is conducted to sustain operation, reduces the contact hazard, and limits the spread of contamination. Operational decontamination is carried by individual and units. It is restricted to specific parts of operationally essential equipment, material and working areas, in order to minimize contact and transfer hazards and to sustain operations. It might occur single soldiers and pieces of equipment or vehicles in bigger range than immediate decontamination.

**Partial Decontamination** is conducted due to reduce the level of contamination to enable perform the task. It relies on partial or complete removal hazardous substances from equipment and people.

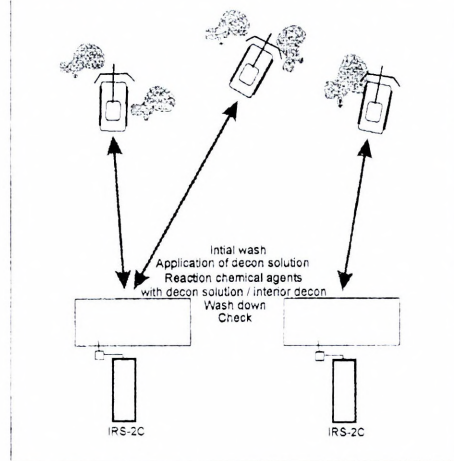
**Complete Decontamination** is the most resource-intensive level of decontamination. It requires support of special decontamination units. Complete decontamination aims are to reduce contamination to negligible risks during combat operations. It allows to take off protective suits and carry out the operation with minimum limitations.

There are three techniques used in complete decontamination:

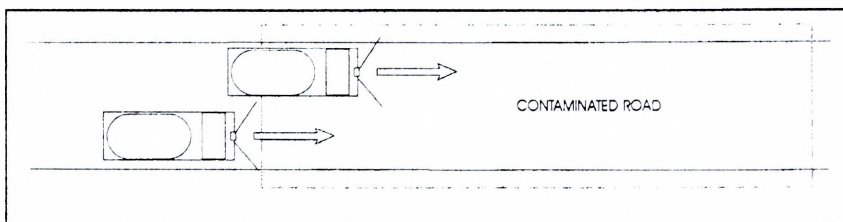
- Detailed troop decontamination (DTD).
- Detailed equipment decontamination (DED).
- Detailed terrain/object decontamination (DOD).

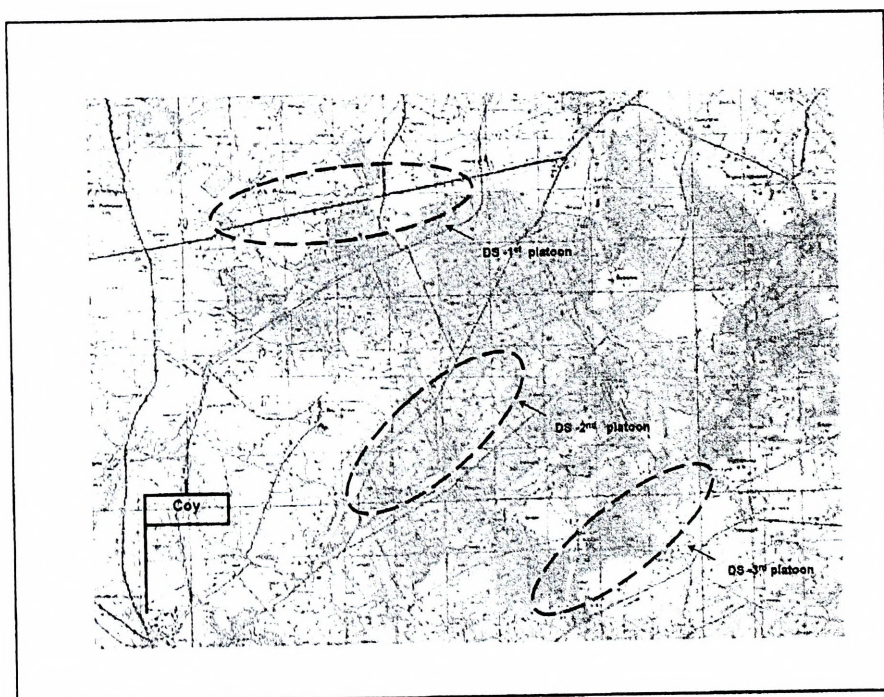
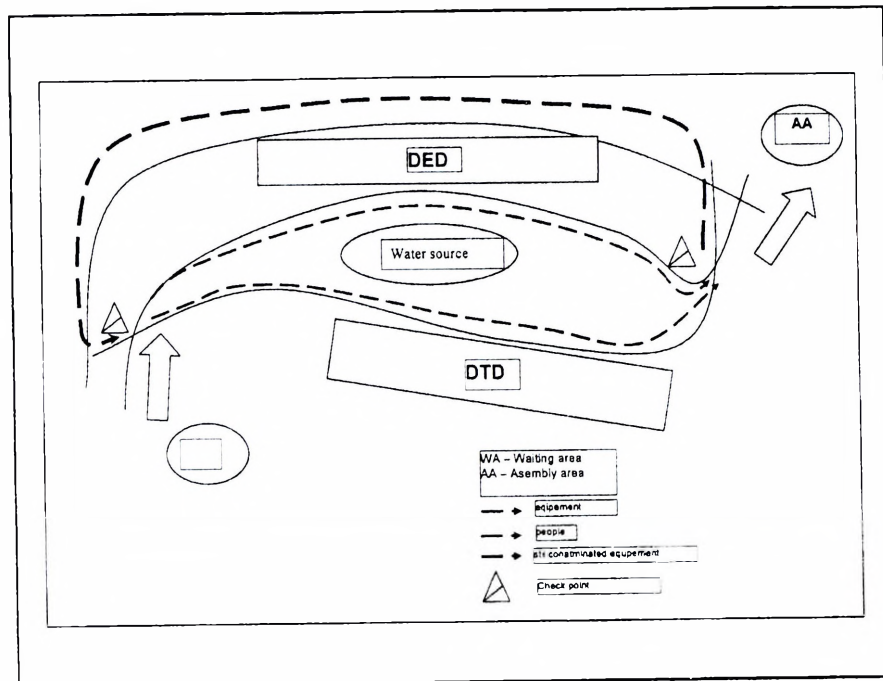


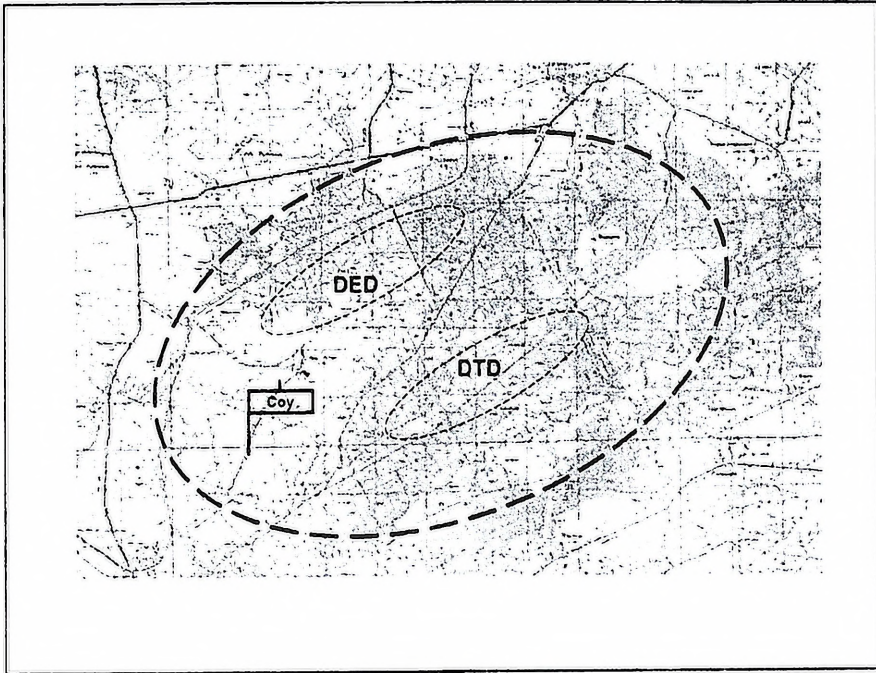
## DETAILED EQUIPMENT DECONTAMINATION ON BATTLE POSITION



## DETAILED TERRAIN /ROAD/ DECONTAMINATION









# NBCR Medical Countermeasure

EMIL LISIAK, MAJ

EPIDEMIOLOGICAL REACTION CENTER of THE POLISH ARMED  
FORCES  
49 Radiowa Str. 01-499 Warsaw, Poland



## AGENDA

- Threats;
- Health service support in NBC environment;
- Medical evacuation and advanced treatment;
- Possible scenario;



## Threats

- Biological warfare agents;
- Chemical warfare agents;
- Nuclear weapons;
- Toxic industrial materials;
- Radiological dispersal devices;
- Chemical, biological, radiological, nuclear, and high-yield explosives.



## Most Likely Agents - Category A

- Smallpox
- Anthrax (*B. anthracis*)
- Plague (*Yersinia pestis*)
- Botulism (*Clostridium botulinum* toxin)
- Tularemia (*F. tularensis*)
- Filovirus (Ebola), Arenavirus (Lassa)



## Chemical agents

- Chocking gases and lung irritants;
- Blister agents;
- Blood agents;
- Nerve agents;
- Herbicides.



## Nuclear and radiologicakl weapon

- Nuclear detonation;
- Pocket-nuclear device.
- Improvised nuclear bomb;
- RDD;

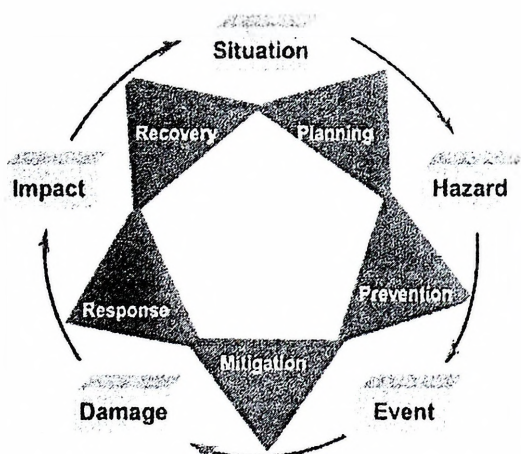


*“NBC terrorism is a low-probability, high consequence event”*

**Richard Falkenrath, John F. Kennedy**  
*School of Government at Harvard University*  
*(Autumn, 1998)*



## NBCR Incident Cycle



The CBRN Incident Cycle has five phases:

- Situation
- Hazard
- Event
- Damage
- Impact

Interventions are applied as the cycle progresses:

- Planning
- Prevention
- Mitigation
- Response
- Recovery



## Situation - Planning

- Conduct NBCR risk/threat assessment;
- Assess population characteristic related to identified hazards;
- Review existing agreements and propose updates;
- Perform capability assesment;
- Identify capabilities for maintaining awereness, monitoring threats, and observing the medical situation.



## Hazard - Prevention

- Identify hazard;
- Identify information required during operations;
- Identify sources for required information;
- Define plans for incorporating preventive capabilities;
- Define communication requirements.



## Event - Mitigation

- Define observable measures for identifying events;
- Define „detection” criteria and thresholds;
- Conduct warning and reporting
- Conduct surveillance;
- Use multiple criteria decision-making processes.



## Damage - Response

- Conduct trade-off between treat-in-place or evacuate-and-replace strategies;
- Identify available assets.



## Impact - Recovery

- Restore operational capabilities;
- Apply lessons learned analysis to assess whether changes/modifications to friendly medical or non-medical capabilities are indicated.



## Threats and medical response

- Large scale intentent/accidental use of WMD
  - Huge number of victims
  - Overloaded military/civilian medical facilities;
- Minor (terrorist) attack;
  - Nuclear reactor/chemical factory accident, dirty bomb, anthrax letters etc.
  - Military/civilian cooperation;
  - Psychological effects!



## **Role of medical treatment**

- Detection of Suspected NBCR agents;
- Causality Decontamination;
- Management of NBCR casualties;
- Triage and Evacuation;
- Disease and non-battle injury surveillance and Epidemiology;
- Field Hospital development.



## **Medical management limits**

- Number of casualties;
- Types of injury (mixed);
- Medical facilities condition;
- Medical supplies.



## Health Service Support C2 Planning

- Likely targets (supply routes, supply nodes, troop concentrations, HQ, key forces, or other high value targets);
- Patient estimates (conventional, NBCR);
- Availability of support resources;
- Availability of required non-medical support;
- Requirements for immunization, pretreatments, prophylaxis, etc.;
- Resource requirements for treatment, evacuation and hospitalization (including enemy prisoners - EPW).



## Actions before NBC Attack

- Training (inc. how to survive attack, effective care for NBCR patients etc.);
- Verifying NBC defense inventories;
- Coordinate with supported units for non-medical personnel for decon procedures.



## Reaction after NBC attack

- All patient arriving at MSF – checked for NBC contamination;
- Decontamination **before** treatment (except life- or limb-threatening)
- Patients require treatment at contaminated station: e.g. respiratory distress, severe shock, massive hemorrhage.



## Medical support in nuclear environment

- Protected shelters essential;
- Nuclear attack – multiple injures (combination of blast, thermal, and radiation injures);
- Three categories of patients:
  - Irradiated (no radiation threat to medical personnel)
  - Externally contaminated (decon procedures required)
  - Internally contaminated (personnel shielded by patient's body).



### **Medical support in nuclear environment cont.**

- Medical facility may be immersed in fallout (decon and/or relocation);
- MasCal due to continued radiation exposure;
- Contamination – evacuation problems;
- Psychological effects.



### **Medical support in biological environment**

- Difficult to recognize !!!
- Monitoring for BW indicators:
  - Increases in disease incidence/fatality;
  - Sudden presentation of exotic disease;
  - Passive defensive measures (immunizations, good personal hygiene, repellents, MOPP);
  - Decontamination of patients;
  - Isolation of patients (if necessary).



## **Medical support in chemical environment**

- All patients from CW environment are **contaminated !!!**
- Initial triage, EMT and decontamination – dirty side of Medical Treatment Facility (MTF);
- First treatment ASAP (atropine etc.);



## **Medical evacuation in NBCR environment**

- A number of ambulances – contaminated in the course of battle;
- Ground ambulances preferred (more plentiful, easier to decontaminate and easier to replace) – compared to air ambulance;
- Special conditions for BW patients.



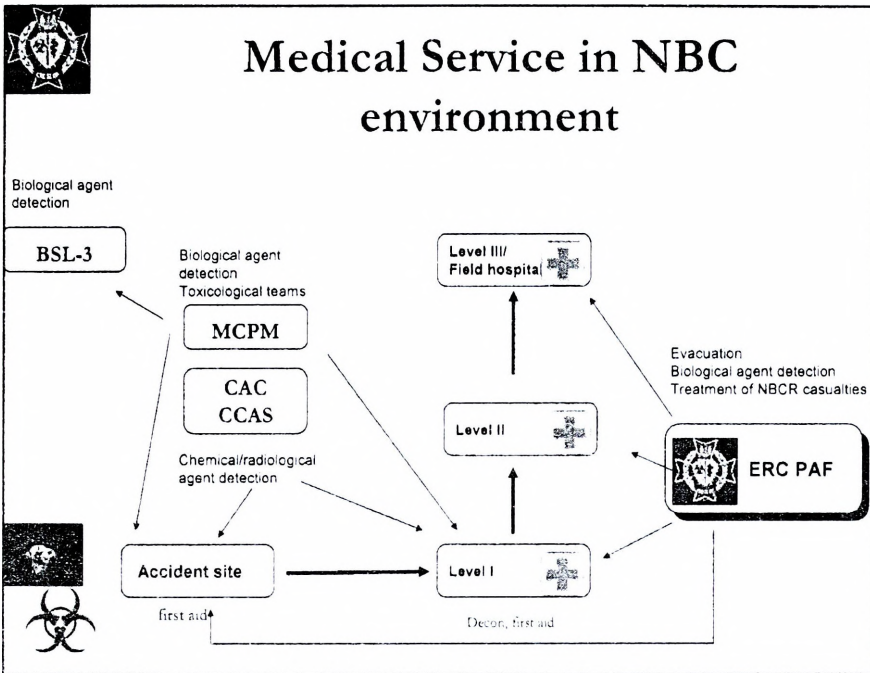
## Medical management principles

- Salvation of Life;
- Salvation of Limb;
- Removal of Continued NBCR Risk;
- Evacuation priorities.





## Military medical management system

- Based on Echelons (Levels) (battlefield, battalion, Brigade, Division, Hospital);
- Higher level - more advanced treatment;
- Medical evacuation priority.



## Medical countermeasure – On site

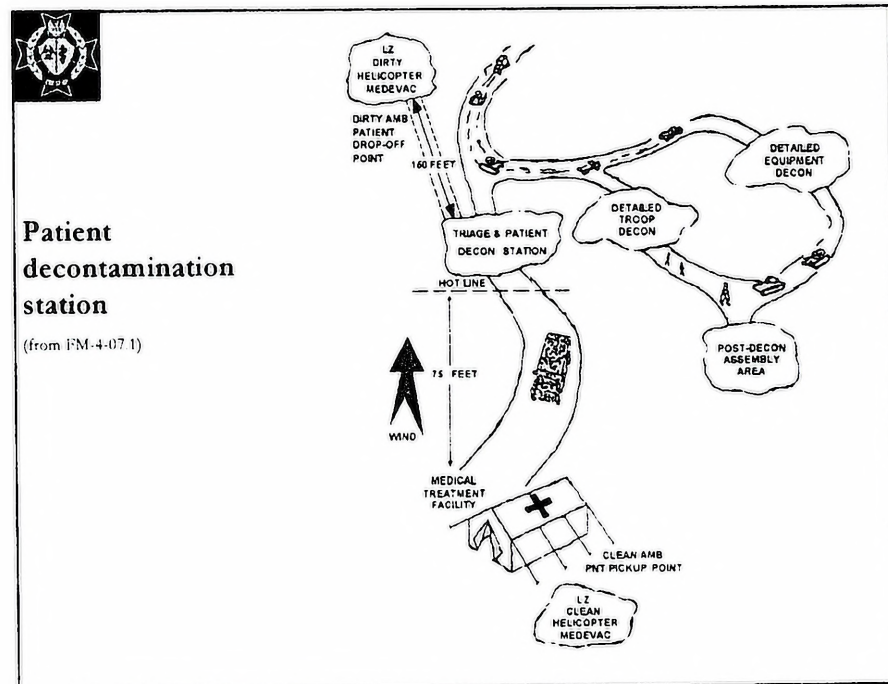
- Self- or buddy aid; Paramedics;
- Autoinjectors (atropine, obidoxime);
- IPR-95 – radioprotective agents for prevention and treatment of radiological/nuclear hazard;
- IPP 95/2002 – individual decontamination, collagen-based self-aid kit.

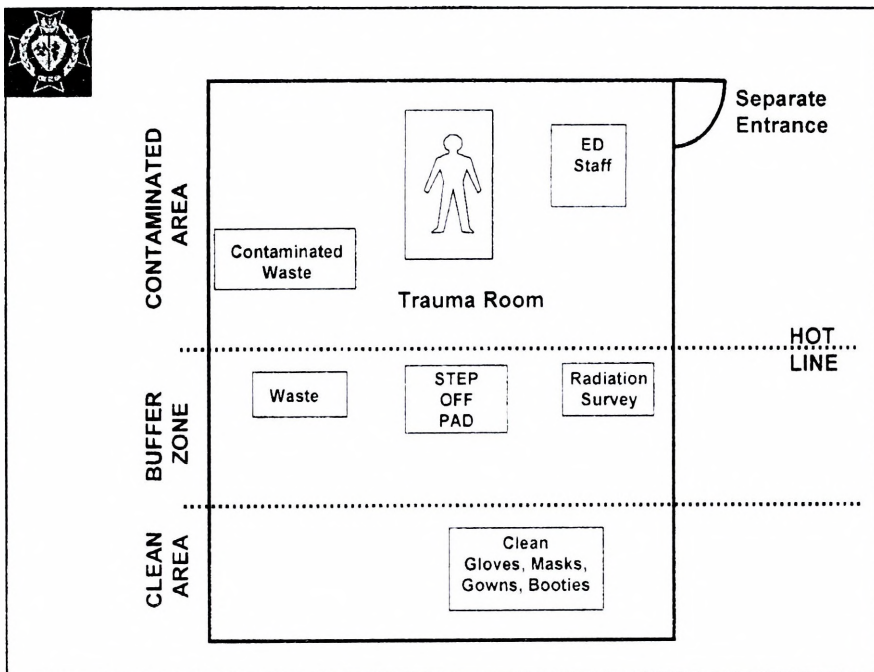





## Medical Management of WMD victims: Level I/II

- Level I:
  - Decontamination procedures;
  - Triage and basic medical treatment;
  - Isolation (BW/ victims)
  - Evacuation (ground, air);
- Level II:
  - Advanced medical treatment;
  - Short hospitalisation;





## Treatment - Decontamination

- Victims (except BW) are no threat to staff
- Contaminated victims
  - Remove shoes and clothes;
  - Soap and water;
  - TEAD, sodium boricum, kalium monosulfurium.
  - Universal precaution barriers are sufficient in most settings
  - 0.1-1 micron respiratory filter and suit



## **Medical Management of WMD victims: Level III/IV**

- Triage and decontamination (if needed);
- Localization : protective factors vs. operational factors;
- BW casualties isolation;
- Psychological treatment;



## **Military Center of Preventive Medicine**

- Mobile epidemiological reconnaissance team;
- Detection of BW agents;
- Primary decontamination;
- Suspicious material transport;
- Hot-spot isolation.



## Military Center of Preventive Medicine

- Mobile epidemiological reconnaissance team;
- Epidemiologist, microbiologist, preventive medicine physicist.
- Decon equipment, fast smart-tests, MOPP and self-air protective suits.

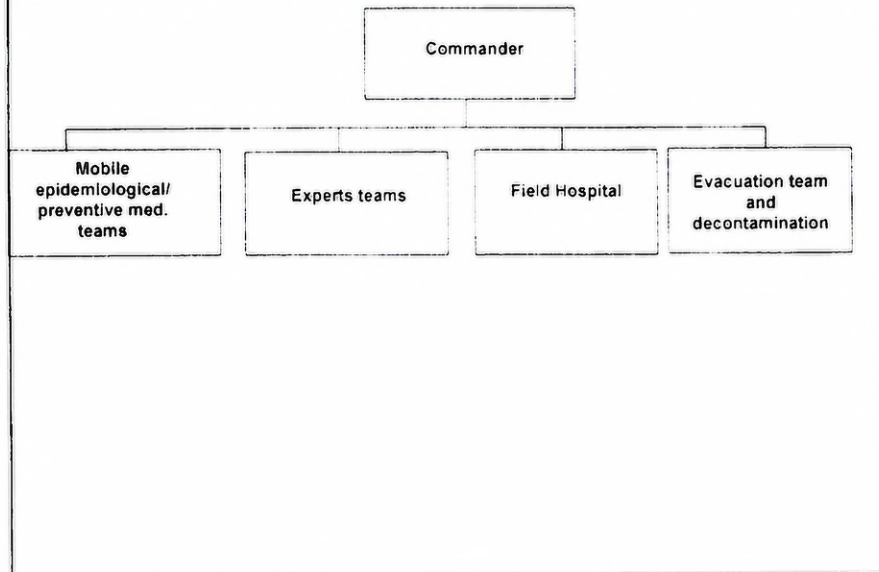


## Military Center of Preventive Medicine

- Mobile toxicological reconnaissance team;
- Advanced medical aid (on-site, Level I/II/III);
- Primary toxicological analysis;
- Coordination (decon units, civilian medical facilities, OAS, COAS);



## Epidemiological Reaction Center



## Experts teams

- Toxicological team;
- Radiological team;
- Epidemiological team;
- Psychological team;



## Experts teams

- Coordination and medical management of WMD victims (Level I/II/III);
- Casualties number estimation and operation planning;
- Psychological prophylaxis and treatment (victims, responders);
- Epidemiological analyses.



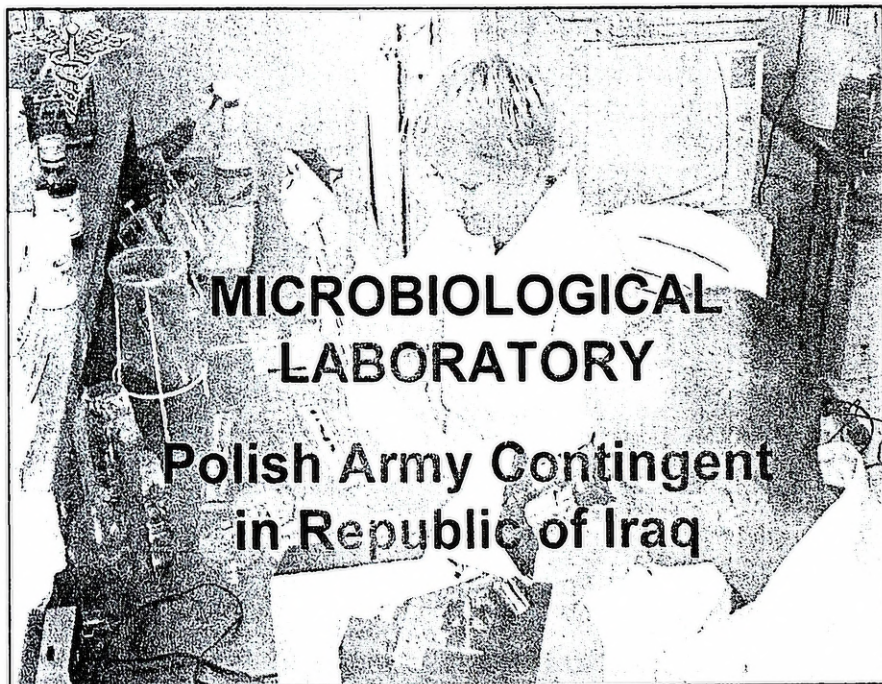
## Scenario

- Botulinum toxin;
- Armored Brigade (~4000 soldiers);
- No vaccination;
- Hidden source (~10km radius);
- Contaminated area: ~448km<sup>2</sup>
- No of contaminated personnel: 2264



## Scenario

- No of casualties: 521;
- No of fatalities (415 beds available): 42;
- No of fatalities (46 beds available): 397.





## MICROBIOLOGICAL LABORATORY

### Microbiological Laboratory tasks in MND-CS area of responsibility:

#### 1. Water analyses:

- Microbiological status;
- Chemical compounds presence.



#### 2) Blood analyses:

- Microscopic examination for Plasmodium sp.
- Quick tests for malaria;
- Microbiological analyses.



## MICROBIOLOGICAL LABORATORY

#### 3) Stool analyses:

- parasites presence;
- presence of Enterobacteriaceae (Salmonella sp., Shigella sp. etc.);
- presence of gastrointestinal bleeding.



- #### 4) Microbiological analyses of urine, pus, smear tests from pharynx, etc.

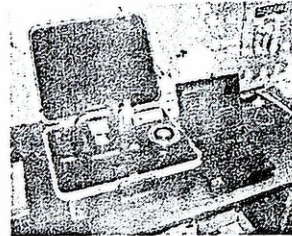




## MICROBIOLOGICAL LABORATORY


### 5) Participation in investigation of mass grave sites:

- Sample collection;
- In situ presumptive testing for presence of BW (SMART Tests);
- Primary decontamination;
- Final laboratory tests.




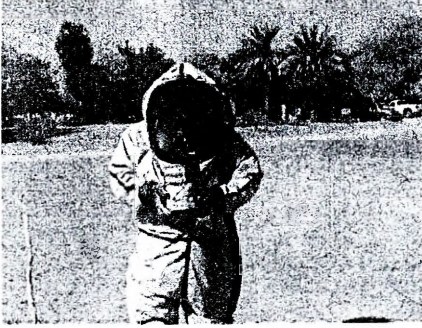
CENTRUM REAGOWANIA EPIDEMIOLOGICZNEGO SZ RP

EPIDEMIOLOGICAL REACTION CENTER OF THE POLISH ARMED FORCES



# BIOMONITORING SYSTEM


EPIDEMIOLOGICAL REACTION CENTER OF THE POLISH ARMED FORCES



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## AGENDA:

- **Biomonitoring system**
  - **Epidemiological reporting system –  
Biomonitoring System - current status**
  - **Biomonitoring System - future concepts**
    - **Equipment and capabilities**

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## WHAT IS BIOMONITORING ?

BIOMONITORING IS THE MEASUREMENT OF THE CONTAMINATION OF THE NATURAL ENVIRONMENT: THE CONTAMINATION OF AIR, WATER AND SOIL.



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3



## WHAT IS BIOMONITORING ? (CONDT)

- PEOPLE'S HEALTH MONITORING AND THE MORBIDITY RATE OBSERVING IN A PARTICULAR POPULATION,
- ESTIMATION OF THE FREQUENCY OF SELECTED DISEASES IN A POULATION SUBJECTED TO THE PARTICULAR EXPOSITION,
- ESTABLISHMENT OF THE CORRELATION BETWEEN THE MORBIDITY RATE AND ENVIRONMENTAL FACTORS,
- PROVIDING DATA NECESSARY FOR PLANNING, ORGANISING AND ESTIMATING PROGRAMMES HOLD FOR PREVENTION, CONTROL AND TREATMENT.




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4

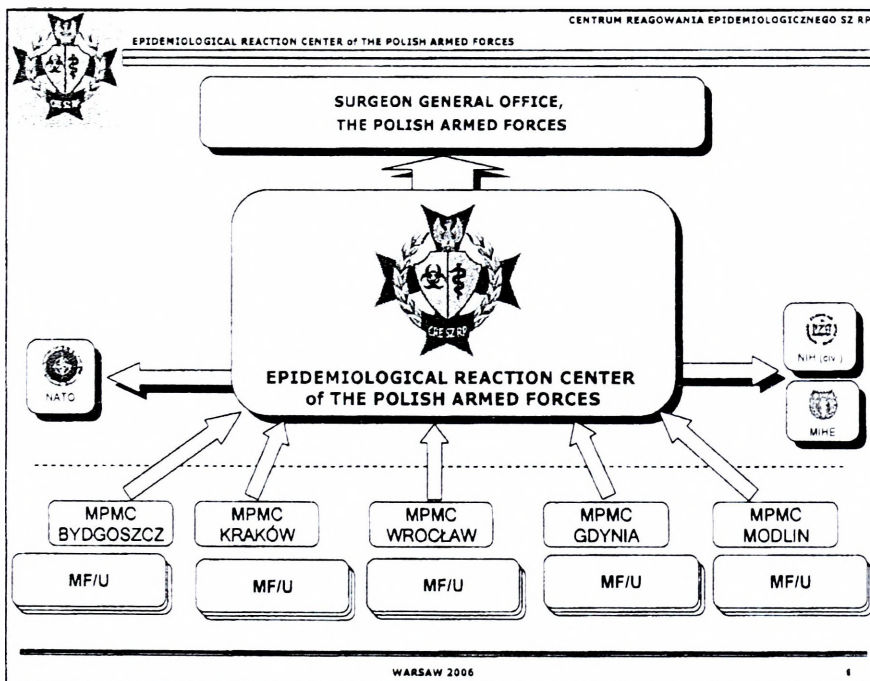
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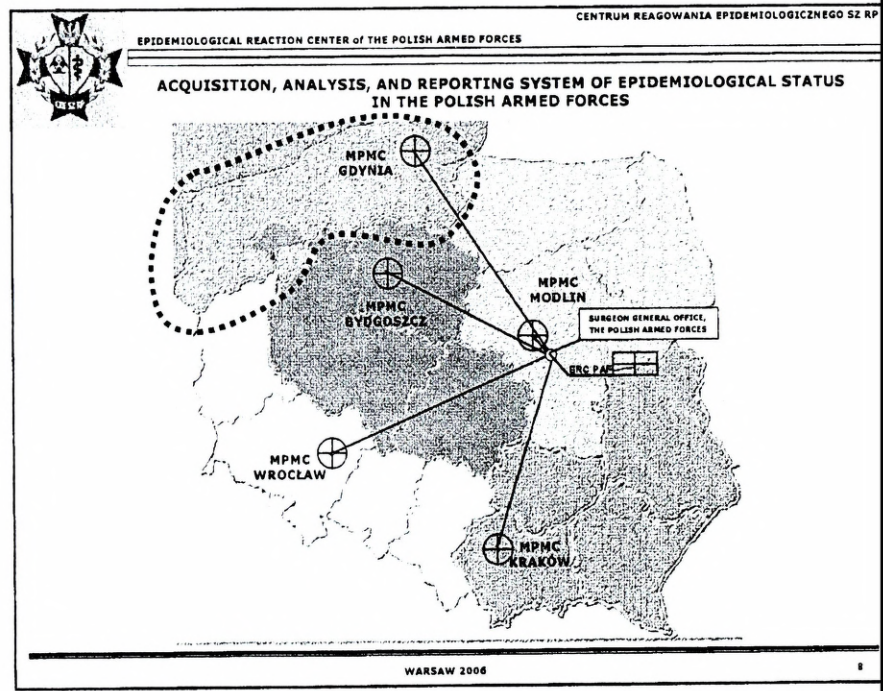
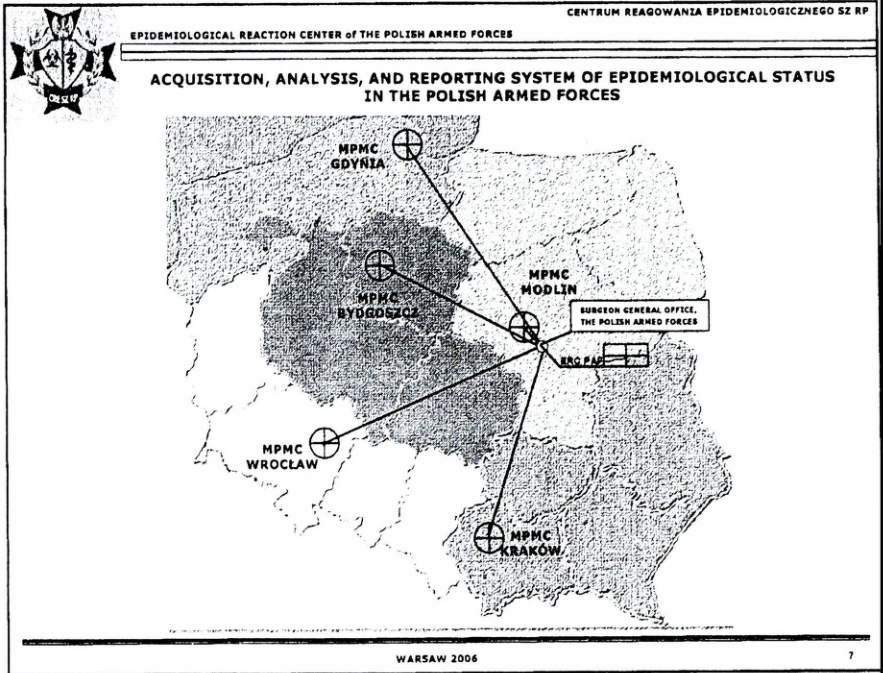
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## EPIDEMIOLOGICAL REPORTING SYSTEM - BIOMONITORING SYSTEM - CURRENT STATUS

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EPIDEMIOLOGICAL REACTION CENTER of THE POLISH ARMED FORCES

### MONITORING OF INFECTIOUS DISEASES IN THE MILITARY UNITS

FILL FORM AND SEND TO MPMC

EPIDEMIOLOGICAL AND SANITARY REPORT No. ... / ...

FROM ... TO ...

UNIT DISEASE (ICD-10)	Armed Forces		Civilians	
	Private	Regular soldiers	Family	Other people
SALMONELLA (A02)				1
INFLUENZA (J10.1)	100	4	6	10

MPMC GDYNIA

MILITARY UNITS

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EPIDEMIOLOGICAL REACTION CENTER of THE POLISH ARMED FORCES

### LOCAL MONITORING OF INFECTIOUS DISEASES IN THE MPMC

FILLED FORM SEND TO ERC PAF

EPIDEMIOLOGICAL AND SANITARY REPORT No. ... / ...

FROM ... TO ...

UNIT DISEASE (ICD-10)	Armed Forces		Civilians	
	Private	Regular soldiers	Family	Other people
SALMONELLA (A02)				1
INFLUENZA (J10.1)	100	4	6	10

ADDITIONAL REPORT

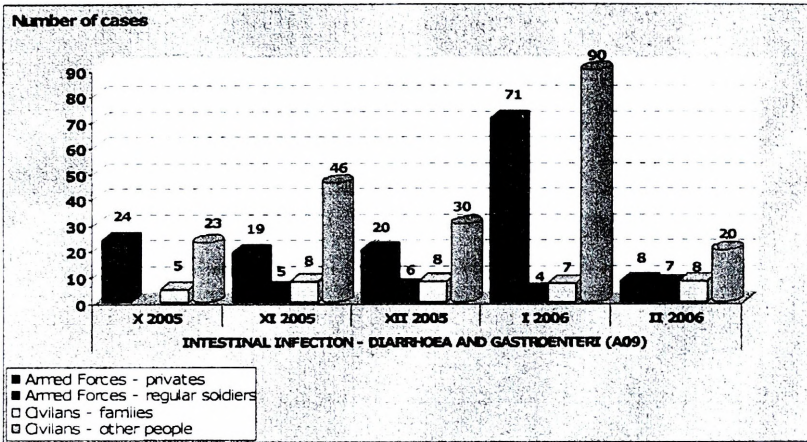
ADMINISTRATIVE DISTRICT	CHOROBY ZŁOZOWE (KOD)	SKAZLIWOSC (KOD)	NIEMIALA (KOD-8)	INFLUENZA (KOD-10)	LYMBODROZJA (KOD-2)	
MAZOWIECKIE	1	2		1		...
LUBELSKIE	6		12		3	...

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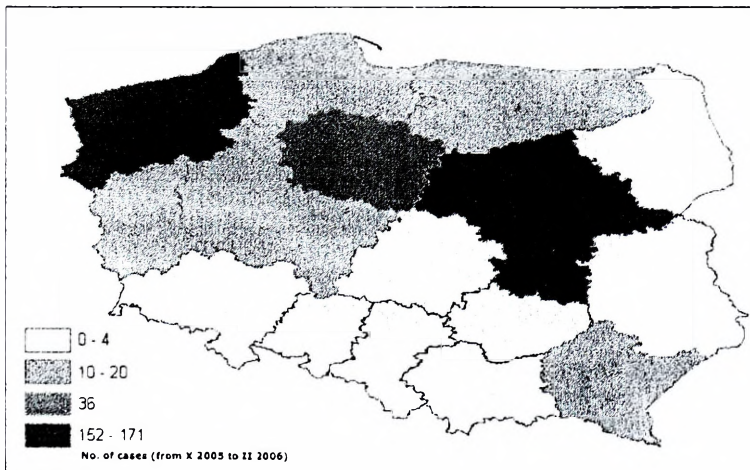


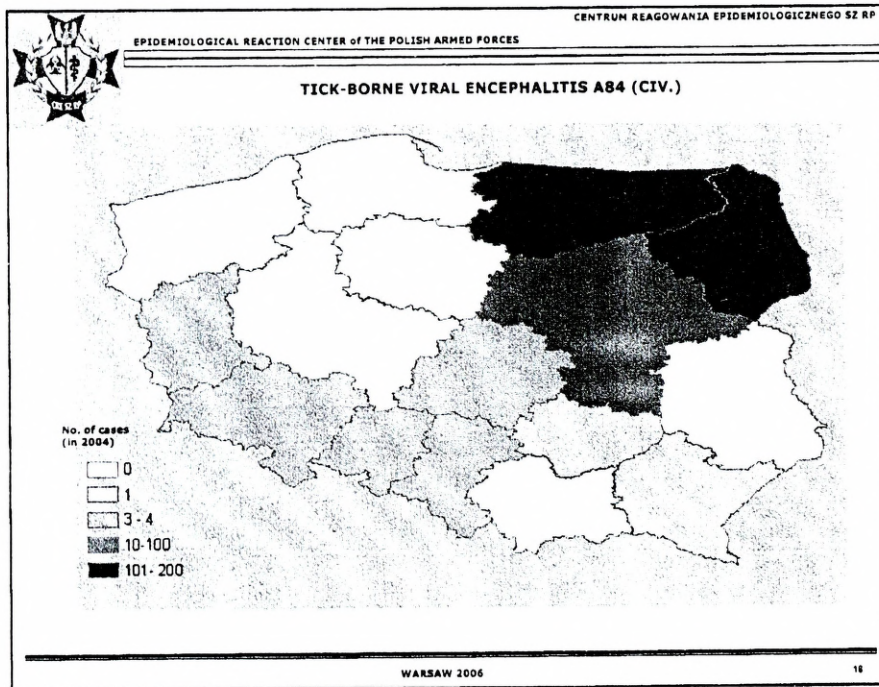
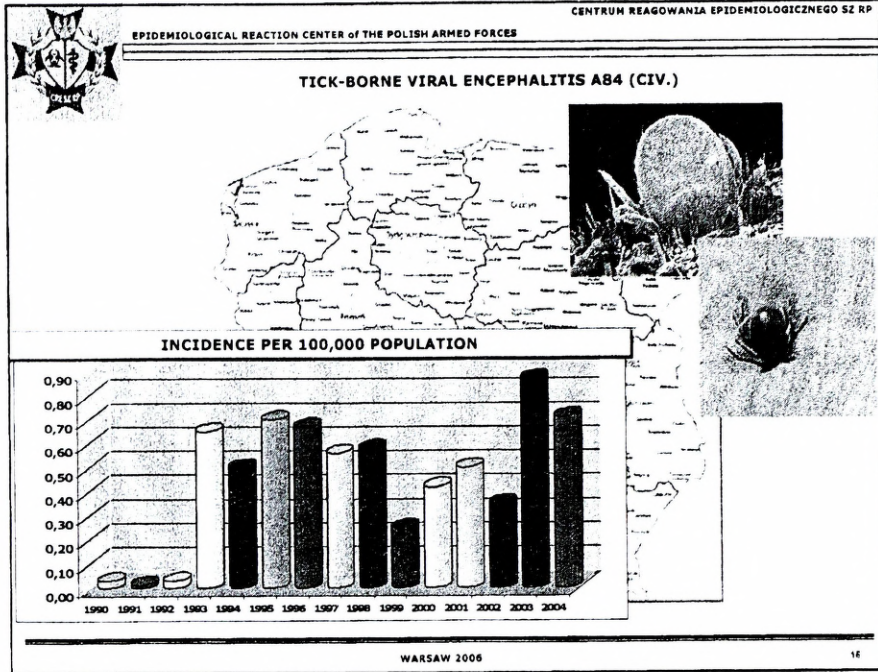


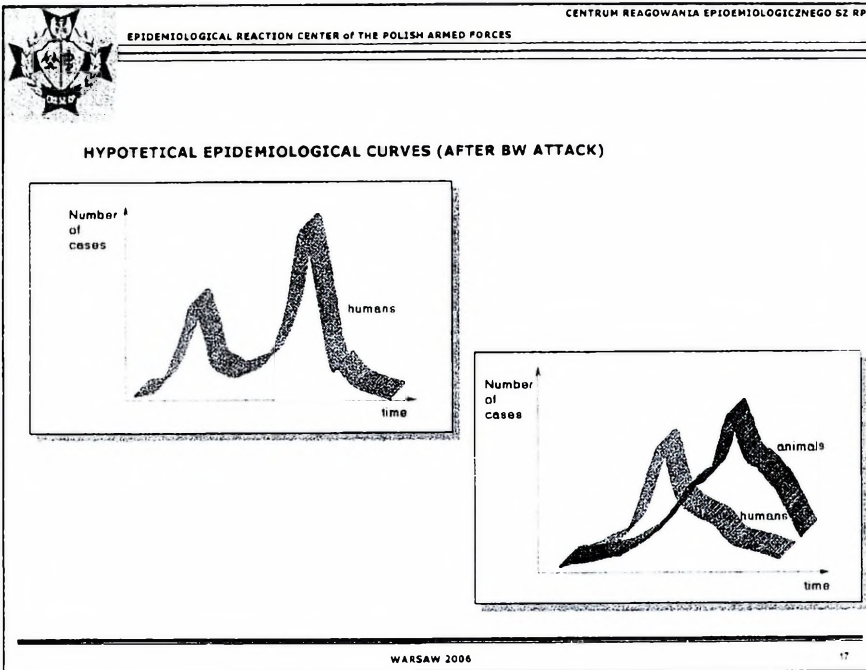
INTESTINAL INFECTION - DIARRHOEA AND GASTROENTERITIS A09 (MIL.)



INTESTINAL INFECTION - DIARRHOEA AND GASTROENTERI A09 (MIL.)








CENTRUM REAGOWANIA EPIDEMIOLOGICZNEGO SZ RP

EPIDEMIOLOGICAL REACTION CENTER OF THE POLISH ARMED FORCES



**IT WAS CURRENT STATUS OF THE BIOMONITORING SYSTEM**

---

**THE NEXT PART OF PRESENTATION : FUTURE CONCEPTS OF  
THE BIOMONITORING SYSTEM  
THESE CONCEPTS ARE BASED ON...**

WARSAW 2006 18



## A GEOGRAPHICAL INFORMATION SYSTEM (GIS)

is a computer system for analyzing and mapping almost everything, moving or stationary.



GIS integrates common database operations, such as query and statistical operations, with the ability to see how data are placed *in space and time.*



In the mid-19th century, death and despair engulfed London. In the Soho district, when nearly six hundred people died from cholera in just 10 days, death tools rang around the clock from the church bell tower.

Dr. John Snow, a London physician, knew that to contain the disease, they would have to find the source.

Using maps showing the locations of water pumps and the homes of people who died of cholera ...

Snow was able to show that one pump was causing most of the disease.

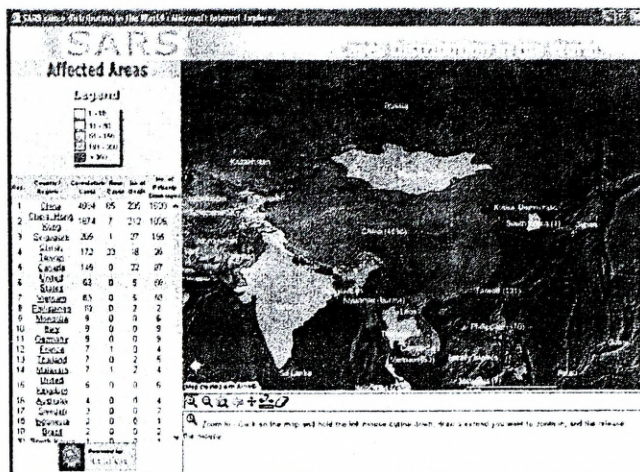


Vibrio cholerae: The bacteria that causes cholera



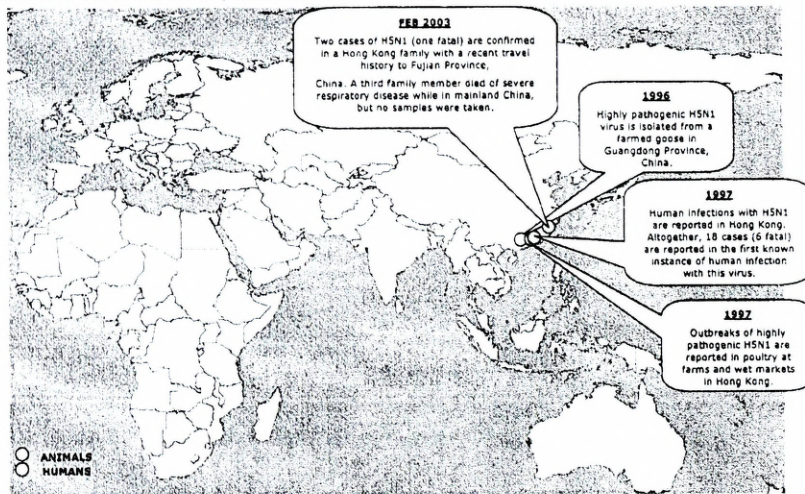


### TRACKING SARS IN THE WORLD WITH GIS



### WHO (GIS) - H5N1 AVIAN INFLUENZA: TIMELINE

#### PREVIOUS EVENTS IN ASIA (FROM 1996 TO FEB 2003)





WHO (GIS) - H5N1 AVIAN INFLUENZA: TIMELINE

WAVE 1 (FROM MID 2003 TO MID-MARCH 2004)

ANIMALS	HUMANS
Thailand	Viet Nam
Republic of Korea	Thailand
Viet Nam	
Japan	
Cambodia	
Lao PDR	
Indonesia	
China	

WAVE 2 (FROM JUN/JUL 2004 TO NOV 2004)

ANIMALS	HUMANS
China	Viet Nam
Malaysia	Thailand
Republic of Korea	
Thailand	
Brussels	

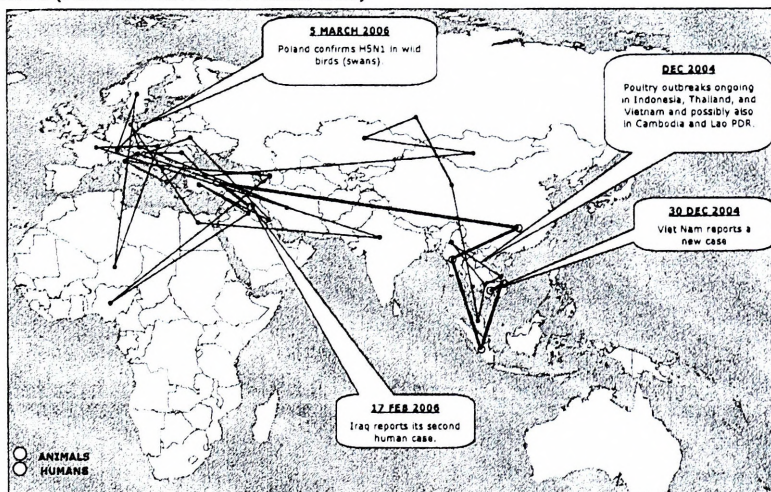
22 OCT 2004

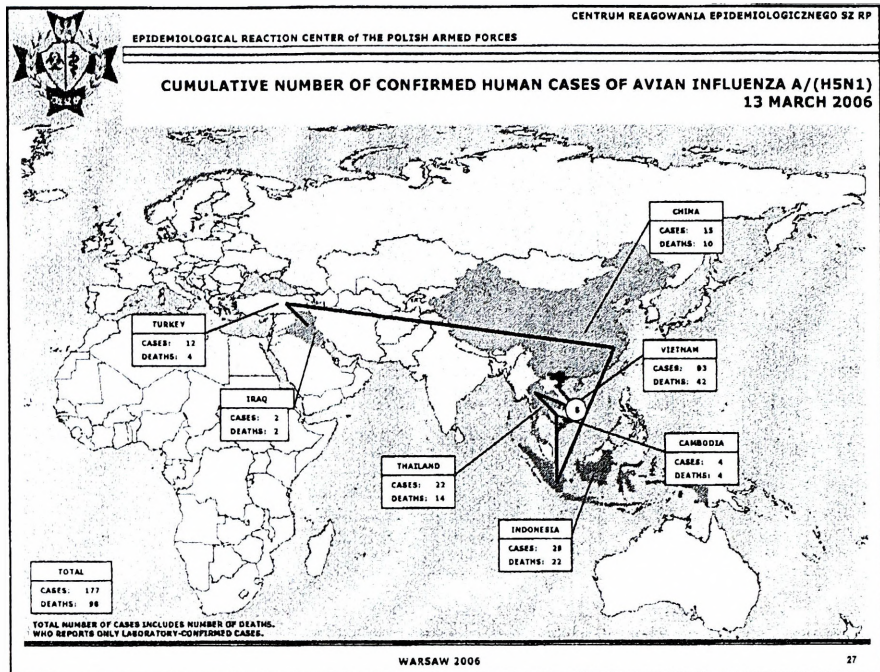
Highly pathogenic H5N1 is confirmed in two eagles illegally imported into Europe (Brussels) from Thailand.



WHO (GIS) - H5N1 AVIAN INFLUENZA: TIMELINE

WAVE 3 (FROM DEC 2004 TO 10 MARCH 2006)






CENTRUM REAGOWANIA EPIDEMIOLOGICZNEGO SZ RP

EPIDEMIOLOGICAL REACTION CENTER OF THE POLISH ARMED FORCES

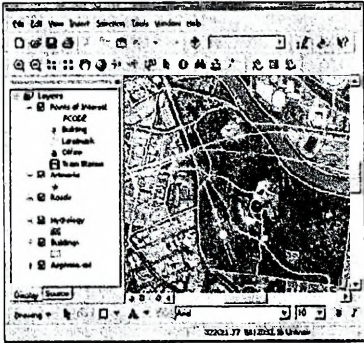
### MOBILE-GIS



**Mobile GIS is the expansion of a geographic information system (GIS) from the office into the field.**

**A mobile GIS enables field based personnel to:**


- capture,
- store,
- update,
- manipulate,
- analyze,
- and display geographic information.



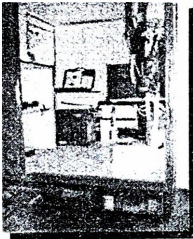
WARSAW 2006 28

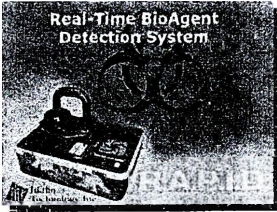
CENTRUM REAGOWANIA EPIDEMIOLOGICZNEGO SZ RP

EPIDEMIOLOGICAL REACTION CENTER of THE POLISH ARMED FORCES



## EQUIPMENT AND CAPABILITIES






Real-Time BioAgent  
Detection System


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29

CENTRUM REAGOWANIA EPIDEMIOLOGICZNEGO SZ RP

EPIDEMIOLOGICAL REACTION CENTER of THE POLISH ARMED FORCES




EPIDEMIOLOGICAL RECONNAISSANCE TEAM




EPIDEMIOLOGICAL REACTION CENTER  
of THE POLISH ARMED FORCES

STATIONARY BIOLOGICAL  
LABORATORY



PREVENTIVE MEDECINE TEAM

---



MILITARY PREVENTIVE MEDICINE CENTER

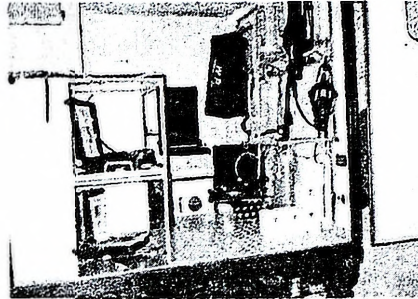
BIOLOGICAL RESPONSE (SURVEY) TEAM (BRT)

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30



### CAPABILITIES OF MOBILE TEAMS:

- **COLLECTION OF SUSPECTED INFECTIOUS MATERIAL:**  
air, soil, water, tissue and food samples.
- **IN SITU PROVISIONAL (PRIMARY) IDENTIFICATION OF BIOLOGICAL AGENTS;**

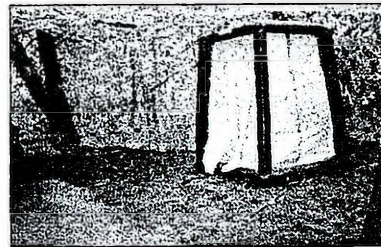


BRT vehicle (inside view)



### CAPABILITIES OF MOBILE TEAMS (CONTD):

- **Detection and identification equipment:**
  - Sample collection equipment and kits,
  - Clinical microbiology equipment:
  - PCR equipment,
  - Biochemical tests equipment and kits,
- **Decontamination equipment:**
  - Portable decontamination tent with a shower,
  - High pressure portable decontamination device,
  - Portable autoclave,
  - Disinfectants (against vegetative and spore forms of bacteria),
  - Equipment for refilling the air bottles,
  - Masks with the HEPA filter,



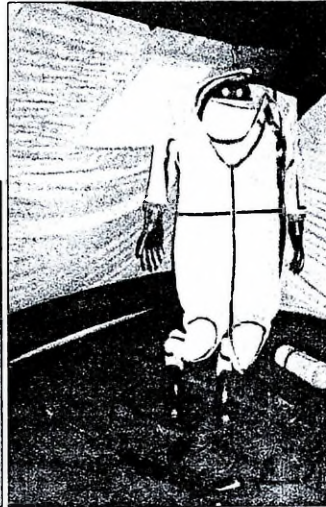
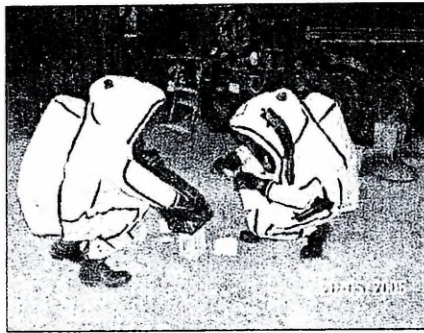
Portable decontamination tent



**MOBILE TEAMS:**

**MEMBERS:**

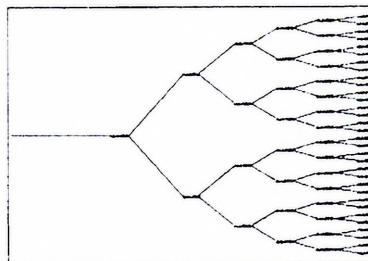
- physician (epidemiologist, prevmed specialist), veterinary doctor, medical analyst, driver-serviceman (WO).



Level A suit with SCBA and air bottle



**PCR (polymerase chain reaction)** – is a basic genetic method which is used to detection of a particular pathogen, differentiation of various strains of a particular biological factor and localization of its source.

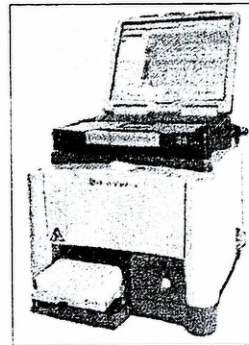




There are also completely automatic systems such as:

- **BIOVERIS,**
- **RAPID,**

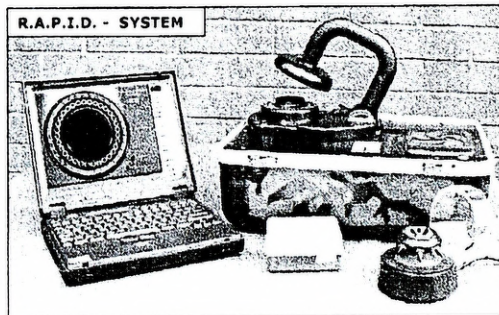
which operate in a battle circumstances and in tasks of reaction teams.



BioVeris - N-SERIES M1M Analyzer



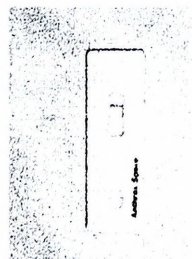
**THE R.A.P.I.D.  
(RUGGEDIZED ADVANCED PATHOGEN IDENTIFICATION DEVICE)**



**ALLOWS FOR FIELD IDENTIFICATION OF POSSIBLY DANGEROUS PATHOGENS QUICKLY,  
SAFELY, AND ACCURATELY.**

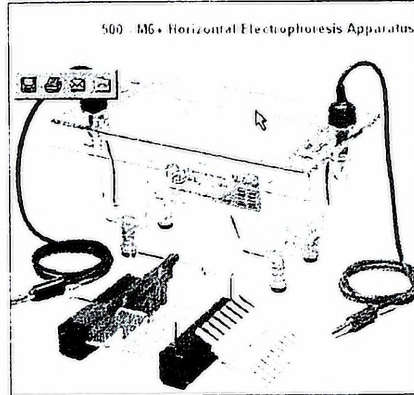


There are also quick immunoenzymatic tests (**SMART**) which can be used for the purpose of a preliminary identification of biological agents in a field conditions.





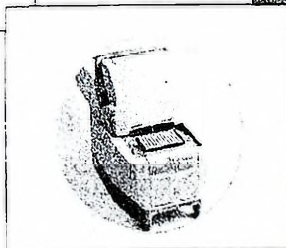
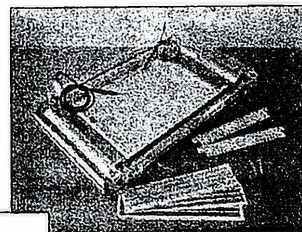
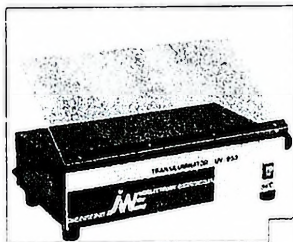
Equipment used for detection of highly pathogenic agents



500 MG Horizontal Electrophoresis Apparatus



Equipment used for detection of highly pathogenic agents (contd)





# COUNTERTERRORISM OPERATIONS

MILITARY GENDARMERIE  
SPECIALIZED UNIT  
WARSAW

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## RANGE OF MILITARY GENDARMERIE

1. ENSURING OBSERVANCE OF MILITARY DISCIPLINE;
2. PROTECTION OF LIFE, HEALTH AND PROPERTY FROM ILLICIT ATTEMPTS AT THEIR VIOLATION;
3. VIP PROTECTION;
4. PROTECTION OF PUBLIC SECURITY AND ORDER AS WELL AS NATIONAL AND BUSINESS SECURITY;
5. CRIME PREVENTION AS WELL AS CRIME DETECTION;
6. PURSUIT OF PERPETRATORS;
7. ENFORCING OBSERVANCE OF LAW AND ORDER AND ADMINISTRATIVE REGULATIONS.

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## **RANGE**



### **OF THE SPECIAL OPERATION BRANCH**

- COUNTER TERRORISM OPERATIONS;
- SEARCHING OF DESERTERS WITH A WEAPON;
- DETENTION (NEUTRALIZATION) OF DANGEROUS CRIMINALS;
- CONVOYING OF DANGEROUS CRIMINALS;
- SUPPORTING VIP CP TEAM (IF REQUIRED).

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## **COOPERATION**



- POLICE;
- MUNICIPAL POLICE;
- BORDER GUARD;
- RAILWAY GUARD;
- FIRE BRIGADE;
- HEALTH SERVICE;
- GOVERNMENT PROTECTION BUREAU;
- MILITARY & CIVILIAN INTELLIGENCE;
- GOVERNMENTAL & NON GOVERNMENTAL OFFICES;
- OTHER INSTITUTIONS (IF REQUIRED).

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## TERRORIST'S THREAT



1. TYPE OF THREAT.
2. MONITORING.
3. SURVEILLANCE.
4. PREVENTION.
5. COUNTERACTION.

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## COURSE OF ACTION



1. INFO IN;
2. INFORMATION CONTROL;
3. PRE PREPARATIONS;
4. RECONNAISSANCE;
5. PLANNING PROCESS;
6. PREPARATIONS;
7. REALIZATION:
  - A. INFO MANAGEMENT;
  - B. ISOLATION OF THE PLACE OF ACTION;
  - C. ELEMENTS DEPLOYMENT;
  - D. ATTACK / HAZARD NEUTRALIZATION;
  - E. EVACUATION;

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## PLANNING PROCESS



1. COMMANDER WITH HIS STAFF
2. WHAT WE HAVE, WHAT WE NEED, WHAT IS NECESSARY?
  - STRENGTH;
  - ARMAMENT;
  - EQUIPMENT;
  - TACTICS & TECHNIQUES;
  - REINFORCEMENTS \ ATTACHMENTS;
  - **COOPERATION.**
3. PLACE OF ACTION.
4. TIME OF ACTION (WHEN, HOW LONG)
5. ELEMENTS TAKING PART IN THE ACTION.  
OUR TROOPS (STRIKE ELEMENTS), NEGOTIATION TEAM, OTHER TROOPS,  
MEDICAL SERVICE, CIVILIAN POLICE, FIRE BRIGADES, PSYCHOLOGIST'S TEAM,  
PRESS TEAM, OTHER.
6. SCENARIO (S) – POSSIBLE COURSE OF ACTION.
7. AFTER ACTION:
  - CASUALTIES,
  - SELECTION;
  - EVACUATION (CASUALTIES, CRIMINALS/TERRORISTS, OUR TROOPS, OTHER  
PARTS TAKING PART IN  
THE ACTION, NON TAKING PART IN THE ACTION)

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# **NBC ANALYSIS**

SYSTEM DEVELOPED BY 

**software utilization in the  
POL ARMED FORCES W&R SYSTEM**

CAPT. MARIUSZ MLYNARCZYK

## **OUTLINE**

- INTRODUCTION
- FEATURES
- PRACTICE
- ADVENTAGES & DISADVENTAGES
- SUMMARY

## INTRODUCTION

### ■ HISTORICAL APPROACH

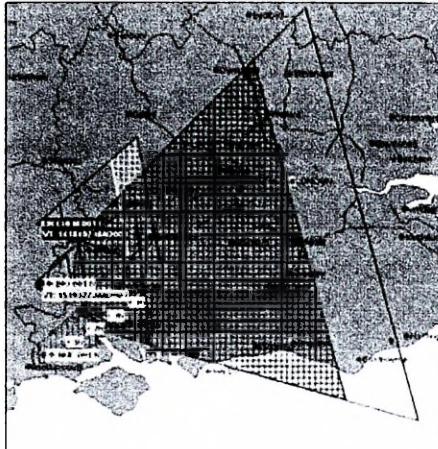
- 2000 – W&R System established in Poland; NBC Analysis introduced to provide information exchange on international level
- 2001 – W&R System developed down to BDE level
- 2002 – HPAC introduced down to Corps and Zone NBC CC (6 month testing period)
- 2006 (?) – RADIUS testing

## FEATURES

- NBC & ROTA PREDICTION
- CONTAINS NATO-APPROVED EMERGENCY RESPONSE GUIDE DATABASE FOR TIH
- FIXED FORMAT MESSAGING (NBC REPORTS)
- ABILITY TO DISSEMINATE WARNINGS AND REPORTS RAPIDLY
- ADatP3 COMPLIANCE FOR PASSING MESSAGES THROUGHOUT NATO ALLIANCE
- BASIC & ADVANCED CALCULATIONS
- MAPPING
- APP-6 UNIT/MAP SYMBOL AS STANDARD
- COMMUNICATIONS & REACHBACK CAPABILITY
- CBRN SUBSYSTEMS INTEGRATION

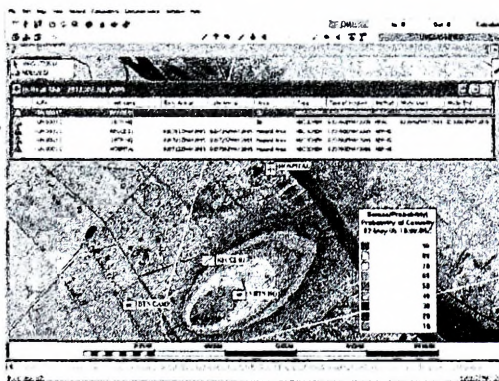
## FEATURES

- Very good for fast warning and reporting with certain redundancy
- These templates are impractical for detailed analysis



## FEATURES

- Model Interface /compatibility with DTRA's HPAC for detailed planning assessment beyond ATP-45 capability



# FEATURES

- MANY VALUABLE SETTINGS AND OPTIONS TO ADJUST PROGRAM PARAMETERS TO USER REQUIREMENTS AND FACILITATE HIS WORK

The screenshot displays a software interface with several components:

- Map:** A map showing a route with points and lines. Labels include '30JUE136722' and 'NFWA3113'.
- Configuration Window:** A window titled 'Configuration' with a tree view under 'Category:'. It includes sub-items like 'Name of own unit', 'Units of Measurement', 'Alfa', 'Map', 'NUC Drawing', 'BIO Drawing', 'CHEM Drawing', and 'ROTA Drawing'.
- Calculations Panel:** A panel titled 'Calculations:' with a table:
 

Calculations	Documentation	1-2
NBC Reports	F5	1-3
Correlate NBC 2 NUC		1-2-3
Dose & Dose Rate		1-2-3
Produce		
- Mode Buttons:** Two buttons labeled 'Mode' with 'EXER' and a blank space below them.
- Calculations Panel (Bottom):** A panel with a refresh icon and three checkboxes:
  - Correlate NBC 2 NUC reports
  - Calculate hypothetical NBC 5 NUC reports
  - Calculate hypothetical NBC 5 CHEM reports

# FEATURES

## NBC 2 to NBC 3 CHEM Calculation:

NBC 2 to 3 CHEM calculation

Maximum number of time periods:

Duration of volatile agents:

**Hazard Levels:**

Calculation method:   Use hazard level LC50

Attack radius:   Use hazard level ICIS

Use hazard level Mosis

## NBC 2 to ROTA 3 calculation:

NBC 2 to 3 ROTA calculation:

Maximum number of time periods:

**ERG:**

Time of dawn:  Z

Time of dusk:  Z

- BASIC CALCULATIONS

- OVER 30 DIFFERENT OPTIONS INCLUDING NBC & ROTA PREDICTION, REPORTING, WARNING, WEATHER ASSESSMENT

## FEATURES

### ■ ADVANCED CALCULATIONS

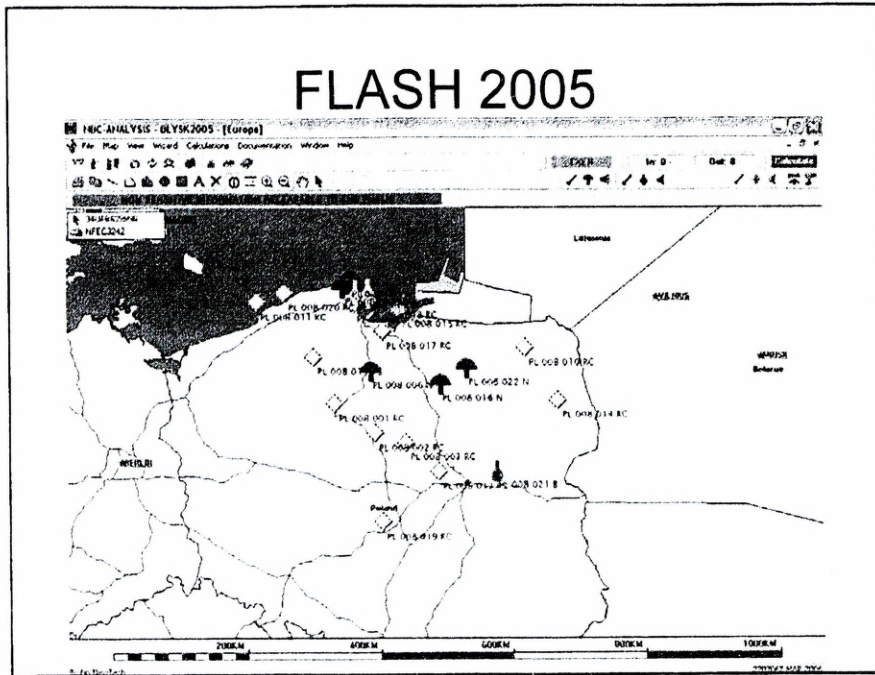
- DAMAGE ASSESSMENT
- DOSE / DOSE RATE CALCULATIONS
- CROSSING CALCULATIONS

Location	SIERRA	Dose Rate	Type	Decay Rate	RIP-11
30UW6891681	011052MAY2005	8.654	DECR		36.208
30UW6891681	011022MAY2005	10.538	DECR		36.208
30UW6891681	010932MAY2005	13.393	DECR		36.208
30UW6891681	010822MAY2005	17.693	DECR		36.208
30UW6891681	01052MAY2005	16.706	INCR		36.208
30UW6891681	010822MAY2005	1.000	INIT		36.208

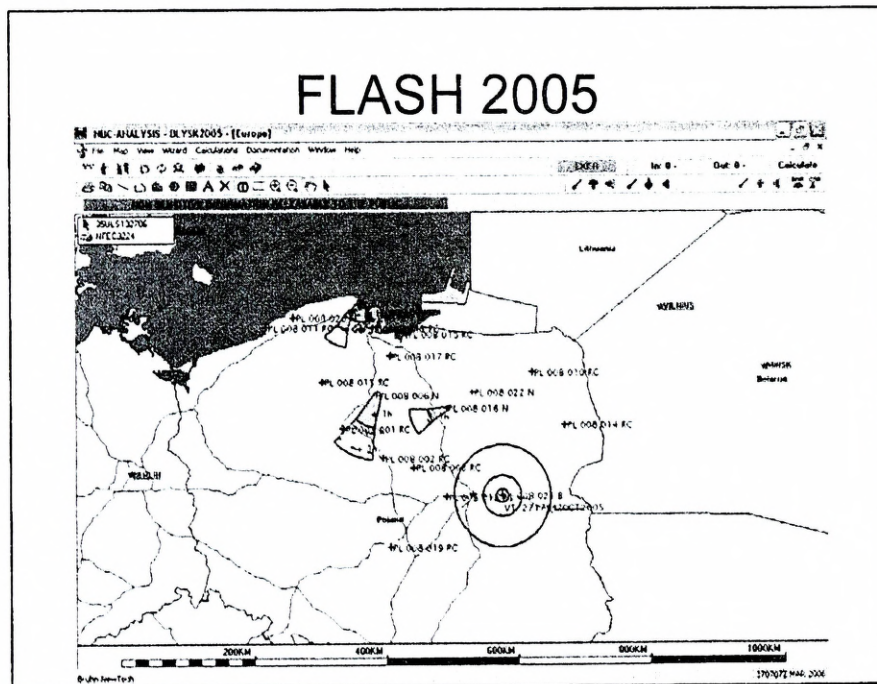
## PRACTICE

- NBC ANALYSIS was used to design NBC scenarios for different exercises:
  - FIRE BALL / FLASH – since 2003 (POL ARMED FORCES LEVEL)
  - POZYTON – since 2005 (POL LAND FORCES LEVEL)
  - BRAVE BEDUIN – since 2004 (NATO W&RS) – to support BDE NBC SCC
  - INTEX 2004 – NATO/PfP wide W&R Systems exercise (on request from NATO Group of Experts of Warning & Detection Systems)

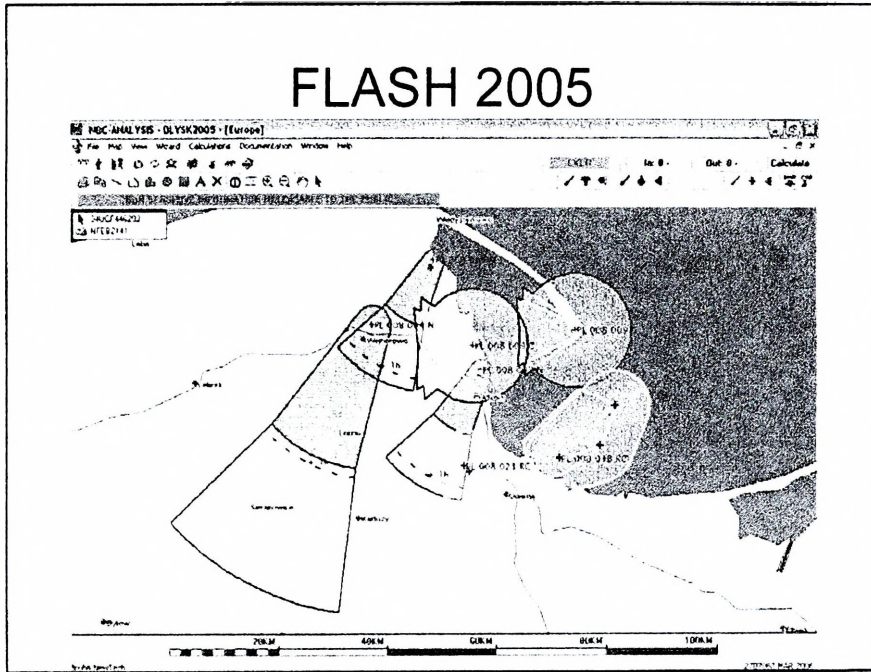
# FLASH 2005



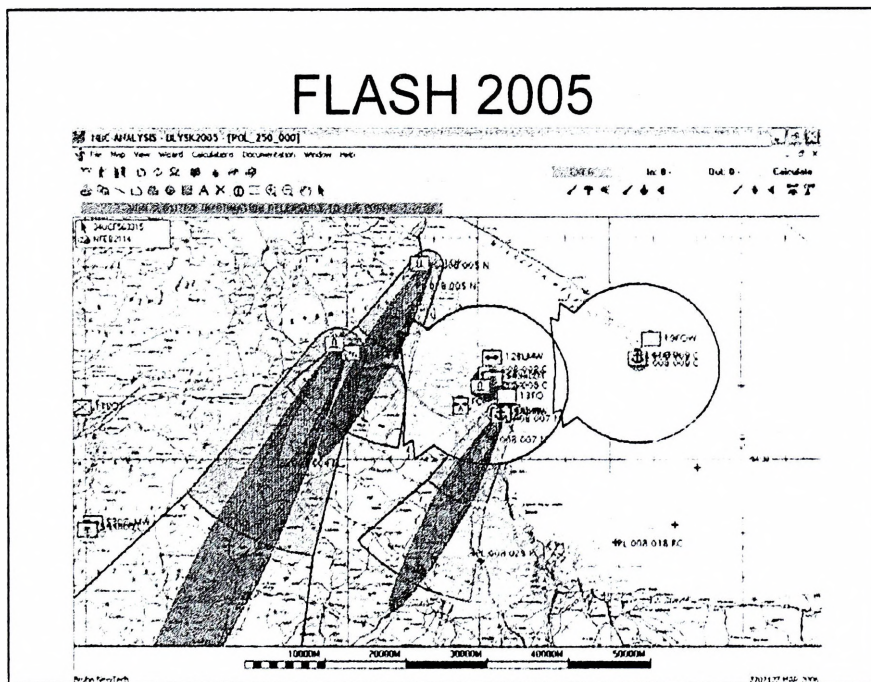
# FLASH 2005



# FLASH 2005



# FLASH 2005





## (DIS)ADVANTAGES

- USER FRIENDLY
  - FAST
  - EXERCISE MODE
  - REPORT CORELATION
  - MAPING FUNCTIONS
  - DROWING TOOLS
  - COMMUNICATION PROTOCOLS
  - CAN BE SUPPORTED BY DIFFUSION MODULES
  - CAN WORK WITH SENSORS
- COSTS A LOT
  - ONLY FOR WARNING AND REPORTING PURPOSES (ACCURACY)
  - CANNOT PRODUCE NBC1s ON A BASIS OF NBC2 IN EXER MODE
  - PROBLEMS TO COMMUNICATE WITH OTHER SYSTEMS
  - SYSTEM BETTER FOR MILITARY THAN CIVILIAN AGENCIES



## (DIS)ADVANTAGES

- OPERATIONAL AND EXERCISE MODE CANNOT BE RUN SIMULTANEOUSLY
- UNIT SIZE CANNOT BE SET SEPARATELY FOR DIFFERENT COMMAND LEVELS
- UNITS' DATABASE CANNOT BE BUILD AS A STRUCTURE OR IN MODULES
- SYSTEM PERFORMANCE SEVERELY DECREASES WHILE OVERLOAD

## SUMMARY

- Very useful for military purposes, less for Civil Emergency Planning
- Linked to HPAC model, provides a powerful mission planning tool for high-profile operations (i.e. as used for Athens Olympic Games by CBRN Bn)



# Epidemiological Reaction Center of The Polish Armed Forces

Commander: Col. Artur Zdrojewski, Ph.D.

## STRUCTURE OF MILITARY SANITARY INSPECTION AND MILITARY VETERINARY INSPECTION

CHIEF OF MILITARY MEDICAL SERVICE –  
MOD MEDICAL ADVISOR



**Epidemiological Reaction  
Center**

General Sanitary Inspector  
of the Polish Armed Forces



**MILITARY CENTER  
OF PREVENTIVE MEDICINE**

**Section of Military Sanitary Inspection**

**Bio-detection Team**

**Medical Toxicological Team**

**Section of Military Veterinary  
Inspection**

**Laboratory**



## Epidemiological Reaction Center

- Subordinated to Surgeon General of Polish Armed Forces;
- Responsible for medical management of NBCR casualties and recognition of BW over the country and during abroad missions;
- Main military center of epidemiologic data analyses.



## Main Tasks

- Protection against mass casualties (BW, bioterrorist attack, appearance of highly infectious disease);
- Quarantine and medical evacuation of infected/suspected victims;
- Sampling of potentially infected material (air, soil, water, food, biological specimens);
- Secure transport of samples to the lab;
- Disinfection and extermination of vermin in operational area;
- Final identification of BW agents (BSL-2/BSL-3 lab).



## Main Tasks

- Deployment of Infectious Field Hospital;
- Medical advising (NBCR);
- Collection and analysis of epidemiological data in military operation area;
- Participation in consequences management of natural or industrial accidents or disasters;
- Elimination of infectious diseases foci caused by BW agents;
- Antiepidemic activities concerning infectious diseases foci.

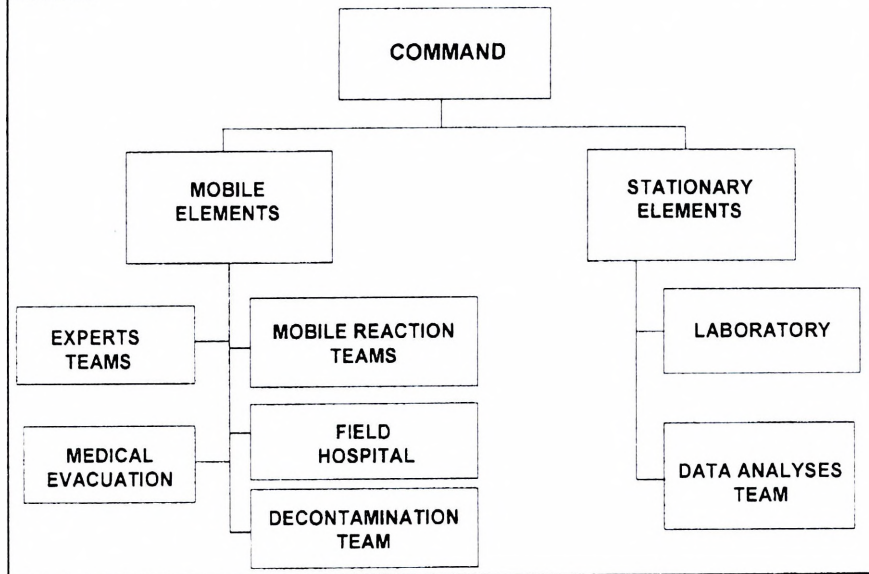


## Main Tasks

- Executing (with chemical units) sanitary activities (decontamination, neutralisation, disinfection, deratisation, exterminating vermin);
- Epidemical protection activities:
  - planning and organisation;
  - vaccination;
  - supervision of the vaccination process.
- Detection, identification and elimination of animal infectious diseases factors in area of responsibility (AOR);
- Conduction of preventive epidemic examinations and investigations.

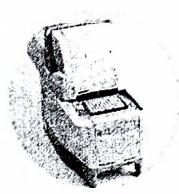


## Structure of Medical Support Part



## Laboratory

- Final microbiological laboratory tests (pathogens and toxins) – BSL-3;
- Classical microbiology;
- PCR,
- Chemiluminometer,





## Data analyses team

- Data collection from MCPM and abroad missions;
- Analysis, epidemiological investigations;
- Infectious disease occurrence monitoring.

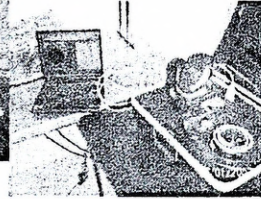
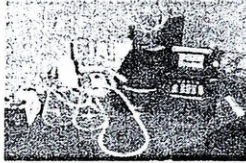
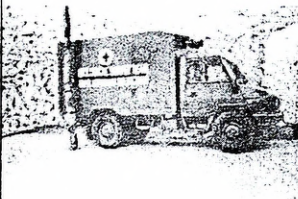
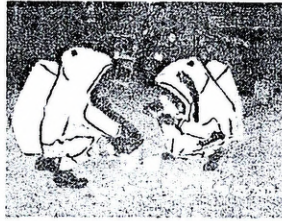
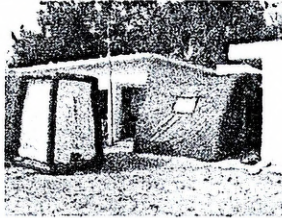


## Mobile Reaction Teams

- Detection of BW agents;
- Primary decontamination;
- Suspicious material collection and transport;
- Hot-spot isolation;
- Members incl.: physician (epidemiologist or preventive medicine), microbiologist, veterinary doctor, medical analyst;
- Decon equipment, fast smart-tests, R.A.P.I.D. and/or BioVeris, self-air protective suits.

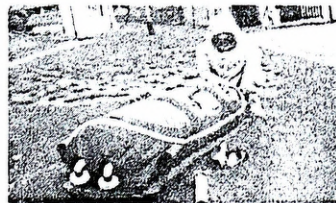
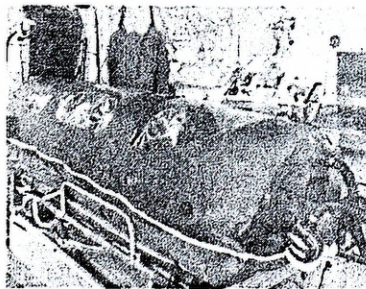


## Epidemiological Reaction Team



## Evacuation team

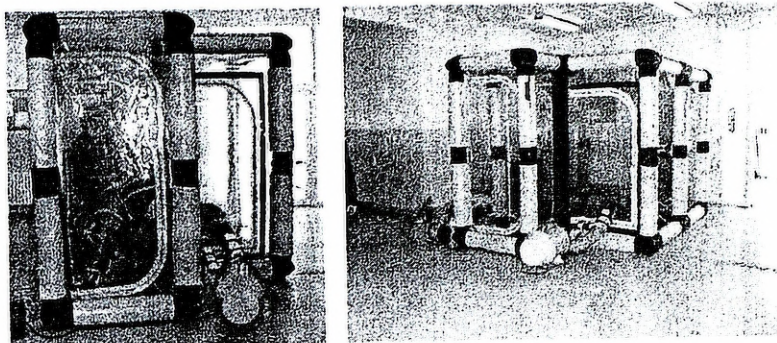
- BW casualties evacuation (individual protective boxes with HEPA filters;





## NBC - resistant tents

- For indoor and outdoor use;
- Overpressure and underpressure systems;



## Experts teams

- Toxicological team;
- Radiological team;
- Epidemiological team;
- Psychological team;



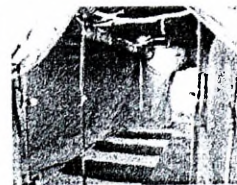
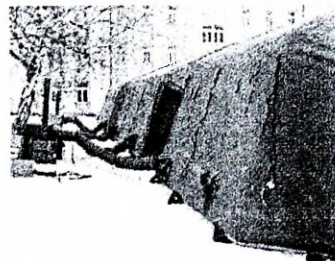
## Experts teams

- Coordination and medical management of WMD victims (Level II/III);
- Casualties number estimation and operation planning;
- Psychological prophylaxis and treatment (victims, responders);
- Epidemiological investigations.



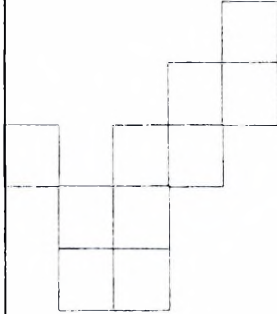
## Decontamination Team

- Cooperation with Engineering/Chemical Units;
- Field Decon Points (NBCR).





## HAZARD PREDICTION AND ASSESSMENT CAPABILITY



# HPAC

Presentation by

Capt. Mariusz MŁYNARCZYK

Ownership of this program resides with



## INTRODUCTION

- HPAC is a forward-deployable, counterproliferation / counterforce capability available for government, government related or academic use
- HPAC software accurately predicts the effects of hazardous material releases into the atmosphere and its human collateral effects on civilian and military populations.

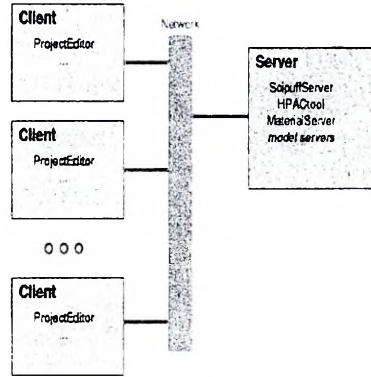
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# STRUCTURE

## ■ Client-server architecture

- Whereas previous versions of HPAC were built as a single application, HPAC 4.0 and above are separated into separate client and server components



## ■ Platform portability

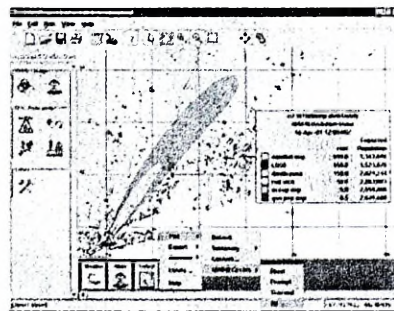
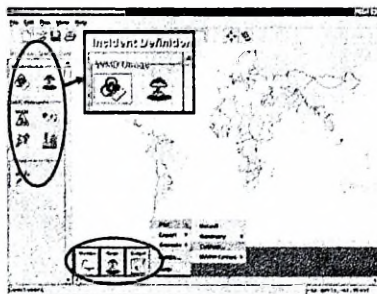
- The Project Editor can be executed in client-server mode on any platform providing a Java Runtime Environment (JRE) that complies with the JRE-1.3 specification and above from Sun Microsystems

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# USER INTERFACE

## Map - based display



Iconic representation of project objects –

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# INCIDENT MODELS

## ■ WMD USAGE

- Nuclear Weapon (NWPN)
- Chemical/Biological Weapon
- Radiological Weapon Incident

## ■ NBC RELEASES

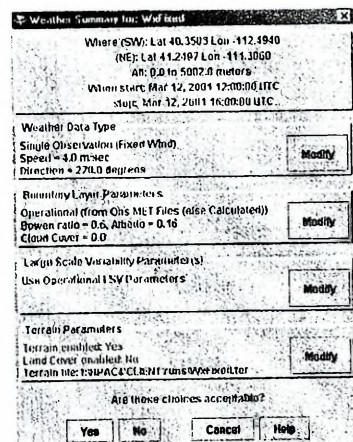
- Chemical and Biological FACilities
- Missile Intercept Release
- Nuclear Facility Release

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# WEATHER

- The **Weather Summary** dialog describes the weather that will be used in an HPAC calculation
- The Summary also has the following four subsections:
  - Weather Data Type
  - Boundary Layer Parameters
  - Large Scale Variability Parameter(s)
  - Terrain Parameters



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## MAPING

OpenMap supports the following data types:

- NIMA ADRG and CADRG
- NIMA VMAP Levels 0 and 1
- NIMA DTED Levels 0, 1, and 2
- NIMA CIB

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## OVERVIEW

- WEATHER
- MAPING
- PROJECT  
PARAMETERS
- INCIDENT MODELS
- SUMMARY

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## Weather, Overview

The environmental data used in HPAC includes weather and terrain. The HPAC CD-ROM provides a ready source of terrain data and historical weather data. However, you can use either HPAC-provided or external sources of weather data:

- HPAC includes two (internal) weather data options: climatology (historical) data or fixed winds data. The internal data offers quicker, but generally less accurate results than using external data.
- HPAC includes a built-in Weather File Editor that lets you manually compose weather data.
- HPAC provides access to external weather data. You may obtain current and forecast data from external sources on the Internet. In particular, you may use HPAC's built-in Request Generator (ReqGen) to download weather data from the HPAC Meteorological Data Server (MDS).

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## Weather, Overview

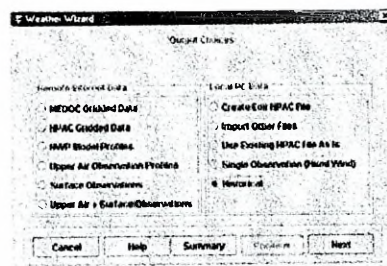


### Weather Data Type

The Weather Data Type block describes the format of the selected weather data.

The weather data types include:

- MEDOC Gridded,
- HPAC Gridded,
- NWP Model Profiles,
- Upper Air Observations,
- Surface Observations,
- Single Observation (Fixed Wind),
- Upper Air Climatology, and Surface Climatology.
- The type also may be a combination of Upper Air and Surface Observations. The selected weather data file names are shown except for Fixed Wind and Climatology selections



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## Weather, Overview

### Boundary Layer Parameters

The *Boundary Layer Parameters* block lists the method that will be used to model the boundary layer method and related parameters. The method may be one of the following: Calculated, Operational, Simple Diurnal, or No Boundary Layer

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## Weather, Overview

### Large Scale Variability Parameter(s)

The *Large Scale Variability Parameters* block lists the method that will be used to model the large scale variability (LSV) and related parameters. The method may be one of the following: User-defined LSV Parameters, Use Internal LSV Parameters, Use Operational LSV Parameters, or No Large Scale Variability.

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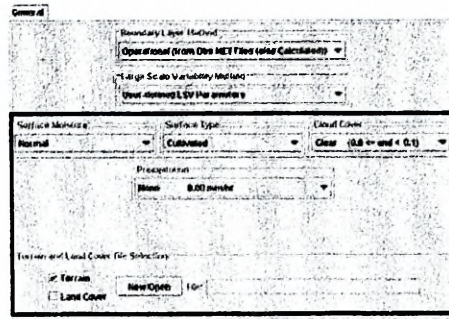


# Weather, Overview

## Terrain Parameters

The *Terrain Parameters* block indicates whether terrain and/or land cover will be used in the HPAC calculations.

The terrain/land cover file name is shown if either terrain or land cover is enabled.

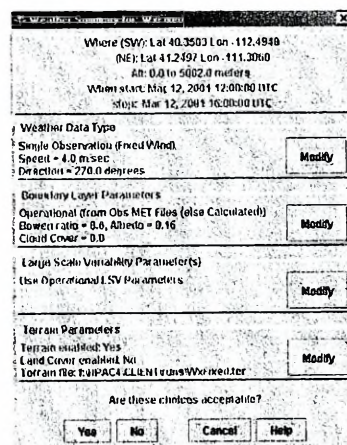


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# Weather, Overview

- The **Weather Summary** dialog describes the weather that will be used in an HPAC calculation
- The Summary also has the following four subsections:
  - Weather Data Type
  - Boundary Layer Parameters
  - Large Scale Variability Parameter(s)
  - Terrain Parameters



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## Map Editor

- The **Map Editor** allows to control the Project Editor Map Display
- The Map Editor window allows to add and delete map layers and turn layers on and off
- The HPAC CD-ROM distribution provides worldwide coverage of 12 map layers

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## Installed Map Projects

HPAC includes two built-in map projects that are easily accessed using **Project Editor's View Menu**:

- Global Land/Sea
- Global Political.

These map projects include three utility layers: Graticule, Contrast Mask, and Day/Night.

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## Map data layers contained in the HPAC distribution

Layer	Data Type	File Format	Tile Size (degrees)	Tiles Per Layer	Source
Airports	Point	CSV	15	Multiple	VMAP
City Names	Point	CSV	15	Multiple	VMAP
DTED Level 0	Raster	Binary	5	Multiple	NIMA
Land Cover	Raster	Binary	5	Multiple	LandScan
Nuclear Facilities	Point	CSV	15	Multiple	VMAP
Political Boundaries	Vector	Shape File	15	1	VMAP
Population	Raster	Binary	5	Multiple	LandScan
Populated Places	Vector	Shape File	15	1	VMAP
Protection Type	Raster	Binary	5	Multiple	LandScan
Railroads	Vector	Shape File	15	1	VMAP
Roads	Vector	Shape File	15	1	VMAP
Water	Vector	Shape File	FOR TRAINING USE ONLY	1	ESRI



## Coordinate systems

User has the choice of viewing and entering:

- Decimal Degrees
- Degrees, Minutes, Seconds
- Military Grid Reference System (MGRS)
- Universal Transverse Mercator (UTM)
- World Geographic Reference System (GEOREF)

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## Supported Map Formats

OpenMap supports the following data types:

- NIMA ADRG and CADRG
- NIMA VMAP Levels 0 and 1
- NIMA DTED Levels 0, 1, and 2
- NIMA CIB

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## Project Parameters

Selecting **Edit Project Params** from the **Project Editor Edit menu** displays a sub menu listing available project parameters. The following sub menu selections are available:

- Flags** displays the Edit Project Flags dialog window
- Limits** displays the Edit Project Limits dialog window
- Options** displays the Edit Project Options dialog window
- Time Intervals** displays the Edit Project Parameters dialog window
- SpatialDomain** displays the Edit Project Spatial Domain dialog window
- TemporalDomain** displays the Edit Project Temporal Domain dialog window

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## Project Flags

- Customization of project flag, which includes the SCIPUFF (dispersion calculation) method and mode, and provides for input of audit information

Dialog box titled "Edit Project Flag" showing fields for Audit information (Analysis, Classification: Unclassified, Date, Project Title, FIPAC Version), SCIPUFF Method (Puff Dynamics, Dense Gas, Static Puffs), and SCIPUFF Mode (Fast Mode, Hazard Puffs, Dual (hazard & std puffs)). Buttons: OK, Cancel, Help.

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## Project Limits

- Customization of limits associated with the dispersion calculation.

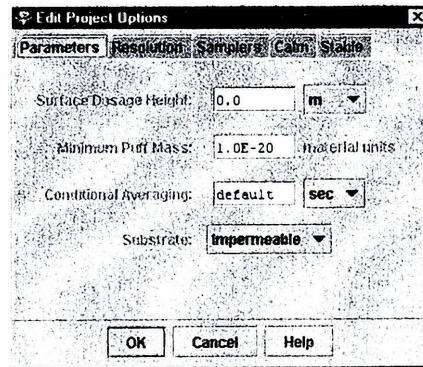
Dialog box titled "Edit Project Limits" showing tabs for Operational, Extended, and Ultimate. Fields for Max Grid Cells Per Surface Field (25000), Max Met Horizontal Array Size (1000), and Max Number of Puffs (20000). Buttons: OK, Cancel, Help.

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## Project Options

- Customization of certain numerical and physical parameters

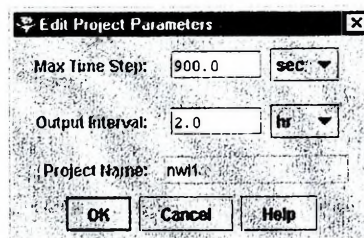


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## Project Parameters

- Edition of computation parameters used by the HPAC simulation algorithms.



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## Project Spatial Domain

- Customization of the spatial domain of the project

Southwest Map

Northeast Map

Resolution

OK Cancel Help

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## Project Temporal Domain

- Customization of the time domain of the project

Start Time

MM DD Year hh mm ss

Stop Time

MM DD Year hh mm ss

Time Interval

OK Cancel Help

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## INCIDENT MODELS

### ■ WMD USAGE

- Nuclear Weapon (NWPN)
- Chemical/Biological Weapon
- Radiological Weapon Incident

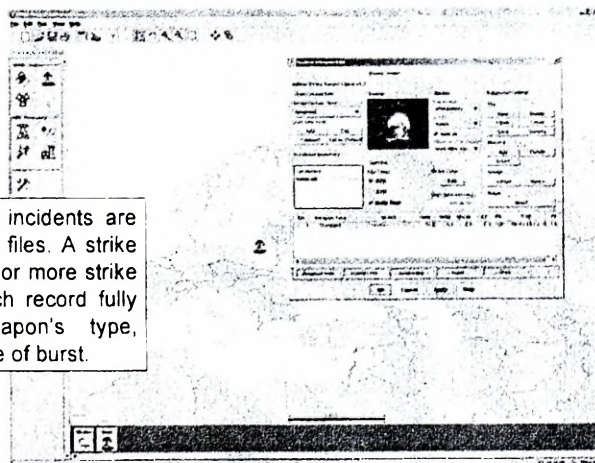
### ■ NBC RELEASES

- Chemical and Biological FACilities
- Missile Intercept Release
- Nuclear Facility Release

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## Nuclear Weapon (NWPN), Overview



Nuclear weapon incidents are defined by strike files. A strike file contains one or more strike records with each record fully defining a weapon's type, location, and time of burst.



## Nuclear Weapon (NWPN), Overview

The supported nuclear weapon placement types are:

- surface or low air burst (referred to as "standard")
- buried, and
- special

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## Nuclear Weapon (NWPN), Overview

The Nuclear Weapon (NWPN) source model is responsible for several different tasks that all fall under the heading of nuclear weapon collateral effects.

They are:

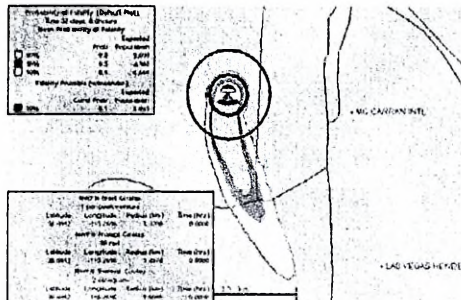
- Building clouds of nuclear activity for HPAC to transport
- Predicting prompt probability of casualty and fatality
- Predicting prompt sure-safe distance (radius) from GZ
- Returning fallout protection factors to the fallout casualty estimator

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## Nuclear Weapon (NWPN), Overview



- Calculation results
  - Probability of casualty and fatality predictions
  - Concentration
  - Surface deposition
  - Radiation dose
  - Casualty table
- Visualization
  - Blast
  - Thermal
  - Prompt

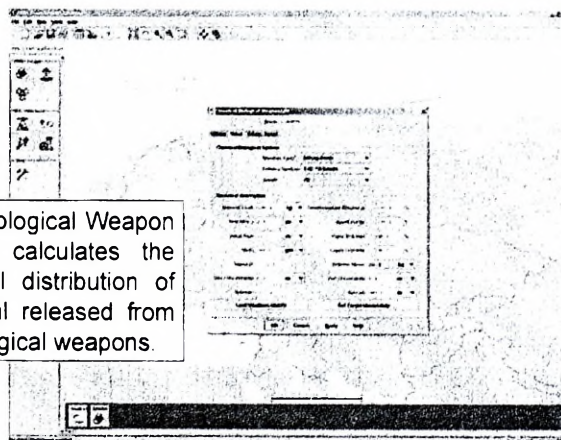


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## Chemical/Biological Weapon, Overview



The Chemical / Biological Weapon (CBWP) model calculates the amount and initial distribution of hazardous material released from chemical and biological weapons.



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## Chemical/Biological Weapon, Overview

### Munition Type

- 100/250/500 kg Bomb
- Rocket
- Aerial Spray
- 152mm Tube
- 122mm Rocket
- 120mm Mortar
- Missile Bulk
- Missile Subs
- Ground Spray
- Land Mine

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## Chemical/Biological Weapon, Overview

### Delivery System

- **Aircraft:**
  - 1 A/C \* 2 Drops  
\* 4 Bombs
  - 2 A/C \* 8 Bombs
  - 4 A/C \* 8 Bombs
  - 1 A/C \* 48 Rockets
  - 2 A/C \* 48 Rockets
- **Artillery:**
  - Battery (tube)
  - Battalion (tube)
  - Battery (rocket)
  - Battalion (rocket)
  - Mortar 36 Rounds
  - Mortar 72 Rounds

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## Chemical/Biological Weapon, Overview



### Non system

Those munitions delivered as a single item, Aerial Spray, Missile Bulk, Missile Subs, Ground Spray and Land Mine, will have a *Delivery System* with the same name.

No other choices are available; however for Missile Bulk, Missile Subs and Land Mine, you may use *Number* or *Submunitions* and *Spread* in the Technical Description to describe an incident with multiple munitions.

For Aerial Spray and Ground Spray, only one source per incident is allowed.

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## Chemical/Biological Weapon, Overview



### Unthickened Chemicals:

- GA – Tabun, a quick acting, non-persistent nerve agent.
- GB – Sarin, a quick acting, non-persistent nerve agent.
- GD – Soman, a quick acting, semi persistent nerve agent.
- GF – a quick acting, intermediate volatility nerve agent.
- HD – Mustard, a semi persistent blister agent.
- VX – a quick acting, persistent nerve agent.

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## Chemical/Biological Weapon, Overview



### Thickened Chemicals:

- TGA – Thickened Tabun, a nerve agent.
- TGD – Thickened Sarin, a nerve agent.
- TGF – Thickened Soman, a nerve agent.
- THD – Thickened Mustard, a blister agent.
- TVX – Thickened VX, a nerve agent.

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## Chemical/Biological Weapon, Overview



### Biologicals:

All biological agents may be modeled as a dry powder or as a water based wet slurry.

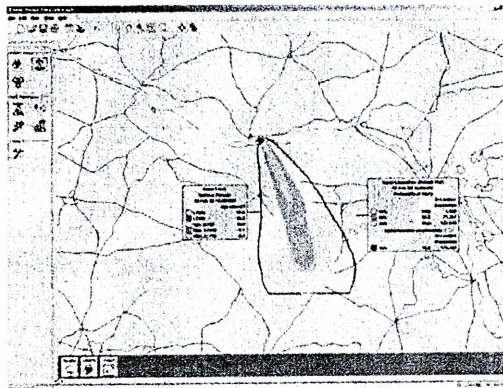
- ANTH – Anthrax.
- BOTX – Botulinum Toxin.
- SEB – Staphylococcus Enterotoxin B.
- PLAGUE – Plague, Yersinia pestis.
- QFV – Q fever, Coxiella burnetii.
- RICIN – Ricin.
- SPOX – Smallpox.
- TUL – Francisella Tularensis.

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## Chemical/Biological Weapon, Overview



- Calculation results
  - Probability of casualty and fatality predictions
  - Surface dosage
  - Surface deposition
  - Dosage duration
  - Concentration
  - Probability of injury
  - Probability of mortality
  - Casualty table



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## Radiological Weapon Incident, Overview



- The Radiological WeaPoN Incident module, or RWPN, computes the source term for explosive driven dispersal of radiological materials.

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## Radiological Weapon Incident, Overview

- Pre-Defined Large Device – A large radiological dispersal device with 1000 kg of High Explosive (HE).
- Pre-Defined Medium Device – A medium radiological dispersal device with 250 kg of HE.
- Pre-Defined Small Device – A small radiological dispersal device with ~50 lbs (22.75 kg) of HE.
- User Specified Device – The user specifies the amount of HE and radioactive material in the radiological dispersal device.
- Import ERAD Source File – enables the **Advanced User: Choose File** button, where you choose the ERAD source file to import. Only the *Type of Material* input box is enabled to allow you to choose the material dispersed.

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## Radiological Weapon Incident, Overview

### Options

- *Calculation Radius* – Set this to the effective range of the incident. The default value is 500 km.
- *Exposure Duration* – Set this to the time duration of the incident. The default is 24 hr.
- *Cloud Dose* – Set this to air submersion dose or cloud shine dose. The air submersion dose (the default) is faster, but less accurate when close to the source and in the case of an elevated release.

### Type of Material

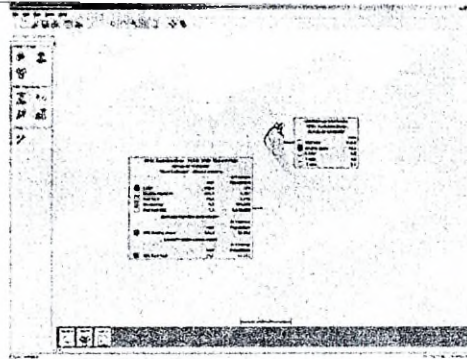
Americium-241	Californium-252	Cesium-137	Cobalt-60	Iodine-131	Iridium-192
Molybdenum-99	Plutonium-238	Plutonium-239	Plutonium-240	Plutonium-241	Potassium-32
Radium-226	Strontium-90	Thallium-201	Thorium-232	Uranium-235	Uranium-238

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## Radiological Weapon Incident, Overview



- Calculation results
  - HPAC Radiation – TOTAL BONE
  - HPAC Radiation – TEDE
  - Surface deposition
  - Concentration

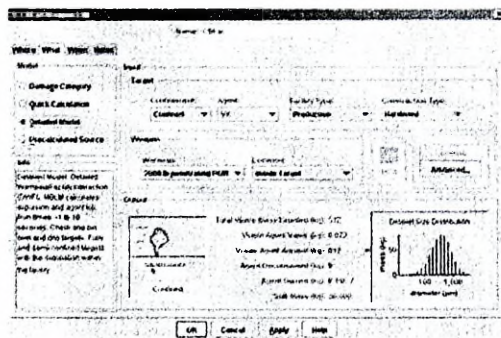


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## Chemical and Biological FACilities (CBFAC), Overview



The Chemical and Biological FACilities module calculates the amount of viable agent released to the atmosphere following a strike against a target containing a chemical warfare agent or a biological warfare agent. The target can be the contents of a structure (confined target), or it can be a target that's in the open (unconfined target).



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## Chemical and Biological FACilities (CBFAC), Overview Model

There are four Model options. The appearance and operation of the **What** dialog changes substantially, based on your selection. Details are provided under the separate Model topics.

- Damage Category – The easiest to use but has very little modeling detail.
- Quick Calculation – Runs very fast, covers both confined and unconfined incidents, and allows for the weapon to be placed in, near, or under the target. Has the greatest number of options at the present time.
- Detailed Model – Has the greatest level of sophistication, but it takes the longest amount of time to run, and at present it only covers confined incidents in which the warhead is placed inside the target.
- Precalculated Source – Allows you to import a CloudTrans file from a calculation previously produced by an external, "expert user".

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## Chemical and Biological FACilities (CBFAC), Overview

### TARGET

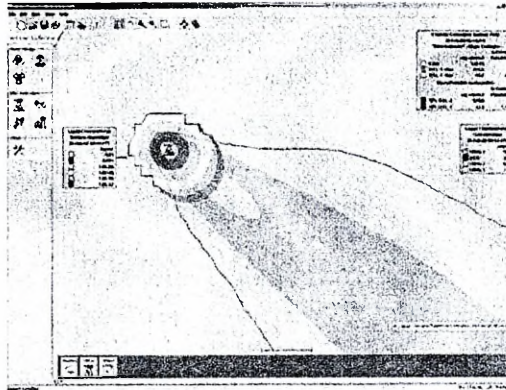
- |   |  |
|---|--|
| ■ Facility Type                             | ■ Construction Type                        |
| <input type="checkbox"/> Production         | <input type="checkbox"/> Hardened          |
| <input type="checkbox"/> Storage            | <input type="checkbox"/> Bermed            |
| <input type="checkbox"/> Weaponization      | <input type="checkbox"/> RC Framed         |
| <input type="checkbox"/> Generic            | <input type="checkbox"/> Concrete Block    |
| ■ Agent                                     | <input type="checkbox"/> Light Steel       |
| <input type="checkbox"/> Chemical warfare   | <input type="checkbox"/> Fully Confined    |
| <input type="checkbox"/> Biological warfare | <input type="checkbox"/> SemiConfined      |
| <input type="checkbox"/> Industrial         | <input type="checkbox"/> SemiConfined Soft |

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## Chemical and Biological FACilities (CBFAC), Overview



- Calculation results
  - Type of agent dependent

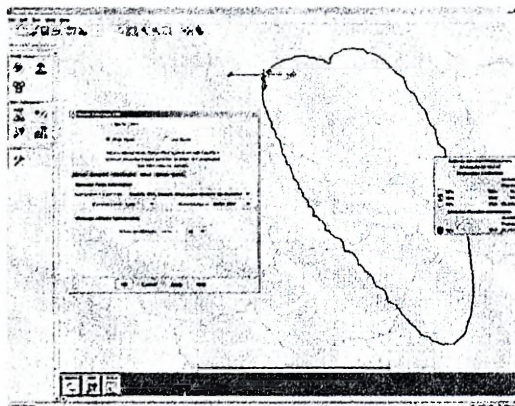


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## Missile Intercept Release, Overview



The Missile Intercept (MInt) model is used to determine hazardous material releases due to the intercept of a missile carrying a chemical or biological weapon payload.



MINT

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## Missile Intercept Release, Overview

The MInt model provides you with two intercept description modes to aid you in describing the characteristics of the intercept event:

- Live Mode format uses flight path information for both the target missile and the interceptor to define the intercept event. This format would be the one to choose if, for instance, the intercept event is recorded on radar.
- Plan Mode format allows you to define an intercept event by describing the positions of the target and interceptor launch points as well as the intended aimpoint of the target missile (useful if you don't have flight path information available).

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## Missile Intercept Release, Overview

### ■ MInt Live Mode

- The interceptor and threat missile involved in the intercept event.
- The damage done to the threat missile by the interceptor
- The hazardous material carried by the threat missile

### ■ MInt Plan Mode

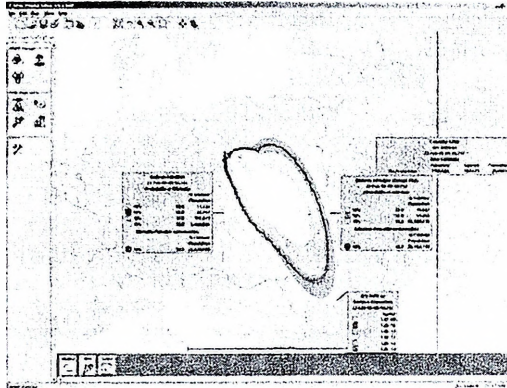
- The interceptor and threat missile involved in the intercept event
- The damage done to the threat missile by the interceptor
- The hazardous material carried by the threat missile
- The flight path information for the interceptor
- The flight path information for the threat/target missile
- The height at which the intercept occurs

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## Missile Intercept Release, Overview



- Calculation results
  - BIO or CHEM agent dependent



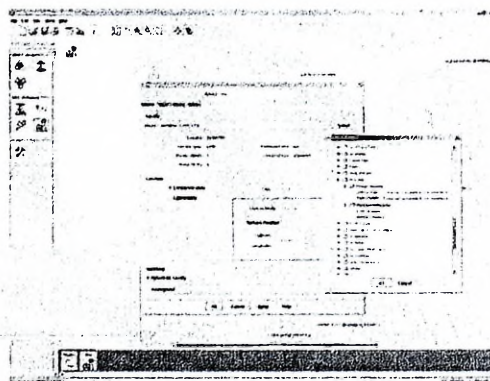
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## Nuclear Facility Release, Overview



The Nuclear Facilities model (NFAC) calculates the radioactive source term for incidents at commercial nuclear reactors, research reactors, and reprocessing plants.

Model Type:  
- Source only included  
- Source included  
- [ ] Source and Analysis



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## Nuclear Facility Release, Overview

In analyzing nuclear facility incidents you may select from either of two estimation modes: Operational or Technical Analysis.

- The Operational mode is best used for quick analyses when you have little or no information about the plant conditions. In this mode you indicate only whether the accident is moderate or severe.
- The Technical Analysis mode can be used when you have more detailed and specific information about the incident. In this mode you can specify the actual radioactive release in terms of isotopic release rates, isotopic concentrations, time-dependent percent inventories, or a specific mix of radionuclides.

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## Nuclear Facility Release, Overview

### ■ Incident Type

- Operational Mode – Moderate or Severe
- Technical Analysis Mode

The screenshot shows a software window titled "Nuclear Facility Release" with a menu bar containing "View", "Print", "Window", and "Help". The "Incident Type" section has three radio buttons: "Moderate Incident", "Severe Incident", and "Technical Analysis". The "Technical Analysis" option is selected. Below this is the "Isotopic Definition" section, which includes a table for "Isotopic Release Rates (x 10<sup>6</sup> Curies / year)".

Isotope	Rate
I-131	100.0

At the bottom of the window are two buttons: "Delete Incident" and "Edit Calculation Database".

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## Nuclear Facility Release, Overview



The NFAC Operational Mode can be used and the operational incidents *Moderate* and *Severe* are available. These indicate categories use predefined time-dependent releases that are specific to each facility type.

- Moderate Incident – These types of incidents involve core damage from the result of a reactor accident but assume that the core containment is not breached. As a result, the source terms mainly involve the noble gas components of the reactor inventory.
- Severe Incident – These types of incidents involve very serious damage to the reactor core and an associated breach in the reactor containment. This results in a large release of radionuclides to the environment.

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## Nuclear Facility Release, Overview



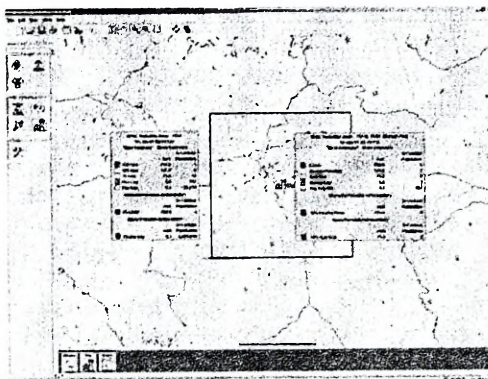
- Time factor (WHEN Tab)
  - Shutdown/Start of Decay – time when the reactor was shut down or when the decay of the isotopic inventory begins.
  - Release to Containment/Confinement – time when the release from the primary containment occurs
  - Release to Environment* – time when the release to the environment begins
  - End of Release* – time when the release to environment ends
  - End of Exposure* – time for the end of the dose calculations
  - Special Case Info* – This box displays a summary of the source term releases including the number of releases and the total duration of the releases.

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## Nuclear Facility Release, Overview



- Calculation results
  - HPAC Radiation – TOTAL BONE
  - HPAC Radiation – TEDE
  - Concentration

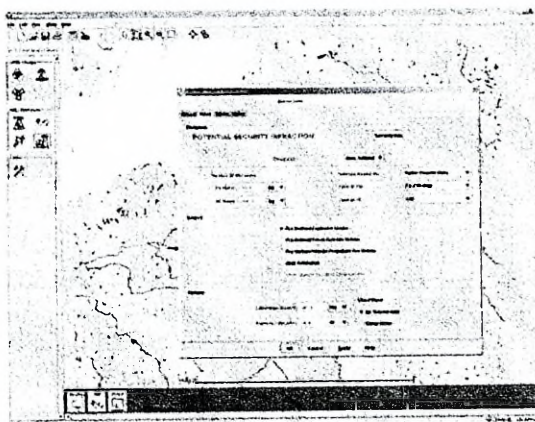


FOR TRAINING USE ONLY

## Nuclear Weapon Incident, Overview



The Nuclear Weapon Incident module, or NWI, computes the source term for explosive, fuel fire or propellant fire driven dispersal of weapons grade plutonium. In addition, it provides, for a given accident environment, a probabilistic weapon response (only in the classified version)



FOR TRAINING USE ONLY

## Nuclear Weapon Incident, Overview



### WEAPONS

- Release Based on one of the following two *Release Basis*: (Note-Applicable for explosive releases only)
  - Roller Coaster Data – data from Roller Coaster series of tests.
  - Sandia Experimental Data – data from the more recent series of Sandia National Laboratory tests.
- Pu Type – five *Pu types*:
  - Pu-239 Only – Pure Plutonium 239
  - 10 yr Hanford – Weapons grade Plutonium produced at Hanford, aged 10 years.
  - 20 yr Hanford – Weapons grade Plutonium produced at Hanford, aged 20 years.
  - 30 yr Hanford – Weapons grade Plutonium produced at Hanford, aged 30 years.
  - 40 yr Hanford – Weapons grade Plutonium produced at Hanford, aged 40 years.
- Type of HE – two *HE types*:
  - CHE – Conventional High Explosives
  - IHE – Insensitive High Explosives

FOR TRAINING USE ONLY

## Nuclear Weapon Incident, Overview



### SOURCE

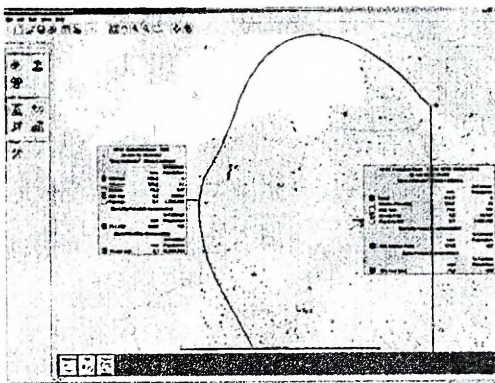
- **Pre-Defined/User Estimated Scenario** –Pre-Defined Explosive Driven – Non-nuclear, i.e., chemical, explosion of all weapon(s) involved.
  - Pre-Define Fossil Fuel Fire Driven – Fuel fire from a B-52 fully engulfing the weapons and causing the release.
  - Pre-Defined Missile Propellant Driven – Missile fire from Peacekeeper fully engulfing the weapons and causing the release.
  - User Estimated – Choose this to enable the **Specify Accident Environment** button, where you can specify the accident environment more completely.
- **User: Specify Accident Environment** – show the User Defined Scenario dialog.

FOR TRAINING USE ONLY

## Nuclear Weapon Incident, Overview



- Calculation results
  - HPAC Radiation – TOTAL BONE
  - HPAC Radiation – TEDE
  - Concentration

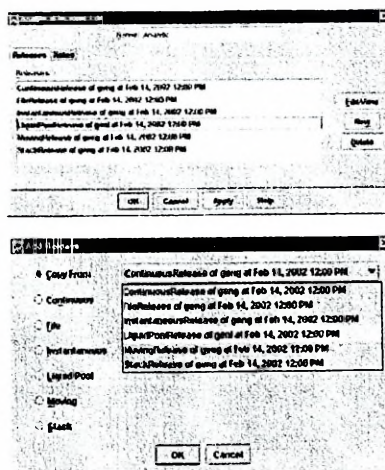


FOR TRAINING USE ONLY

## Analytical Incidents



Analytical Incidents represent an advanced user capability of HPAC. There is no source model associated with the incident, so the user must specify all releases associated with the incident. When first created, an analytical incident will have a single continuous release which may be deleted or modified at will. Additional releases may be added as desired, and releases may be assigned to different locations for representation



FOR TRAINING USE ONLY



## SUMMARY

- Demonstrated ability to process input and output data from the modules.
- Explained HPAC outputs for modules.
- Demonstrated the ability to output casualty estimates (graphic, tabular, in the open, and in structures).

FOR TRAINING USE ONLY



## Military Institute of Chemistry and Radiometry

### Mission, Tasks and Achievements

00-910 Warsaw, al. gen. A. Chruściela-Montera 105  
tel./fax (48)(22) 673 51 80, tel. (+48) (22) 673 58 51,

e-mail: sekretariat@wichir.waw.pl

[www.wichir.waw.pl](http://www.wichir.waw.pl)

Maj Grzegorz Nyszko



## MILITARY INSTITUTE OF CHEMISTRY AND RADIOMETRY

Military Institute of Chemistry and Radiometry is the research and development center of Polish Ministry of National Defense established in 1954. Main scope of the activity of the Institute is scientific research and development projects and studies in the field of the NBC defense equipment and systems as well as the verification of the chemical disarmament processes.





## DEPARTMENT OF SKIN PROTECTION, SMOKE AND INCENDIARY AGENTS

The department performs scientific research and development studies and projects in the field of:

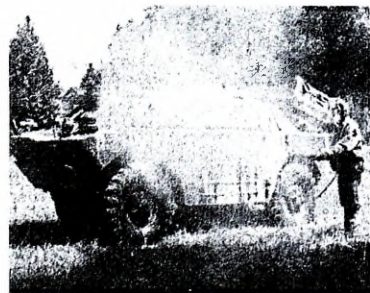
- protective materials technology and insulating and filtering clothes manufacturing;
- smoke generating and incendiary agents as well as related equipment;
- resistance materials and equipment to the thermal impulse;
- radiation screening materials;
- screening and barrier materials and corrosion protective covers used for military equipment storage;



## DEPARTMENT OF NBC DECONTAMINATION AND OPERATIONAL EVALUATIONS

The department performs scientific, research and development studies and projects in the field of:

- decontamination technology, means and equipment;
- protection of the military equipment surfaces by using special coatings against chemical and radiological contamination;
- decontamination and skin protection means;
- synthesis for research applications of chemical compounds included in the Schedules of the Chemical Weapons Convention;

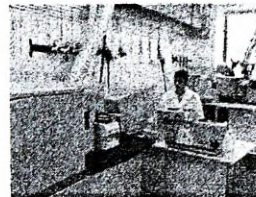
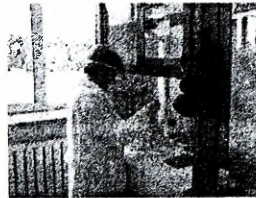




## CHEMICAL RECONNAISSANCE DEPARTMENT

The department performs scientific, research and development studies and projects in the field of:

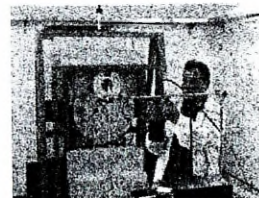
- detection and identification of the high toxic chemical compounds (CWA and TIC);
- evaluation and testing of means and equipment for chemical reconnaissance;
- qualitative and quantitative chemical analytical analysis;
- analytical verification of the implementation of the CWC



## DEPARTMENT OF DOSIMETRY AND RADIAC EQUIPMENT

The Department performs scientific, research and development studies and projects in the field of:

- nuclear radiation detection technologies and equipment;
- measurement of selected parameters of nuclear radiation fields;
- gamma and neutron radiation propagation in shielding materials;
- calibration of RADIAC equipment;
- special mobile systems of NBC detection;





## DEPARTMENT OF RESPIRATORY PROTECTION

The Department performs scientific, research and development works in the field of:

- individual and collective respiratory protection means and systems;
- testing methods and technology of sorption and filtration materials;
- laboratory and operational military evaluation methods as well as testing requirements for verification of protection equipment.



## PRODUCT CERTIFICATION BODY

- (PCA accreditation No. AC 049)
- Certifies following products:
  - CWA and TIC's detection equipment;
  - Nuclear radiation detection equipment;
  - Decontamination means and systems;
  - Skin protection means and systems;
  - Individual and collective respiratory protection means and systems;
  - Aerodispersional battlefield camouflage means and systems;
  - Radiation protection shields;
  - Corrosive protection covers for long term storage of armament;

Also products of similar destination used in other branches (environmental protection, rescue service)



## TECHNICAL EXPERTISES BODY

- **Performs evaluations and expertises and gives opinions for the needs of:**
  - **Concessioning of producers and suppliers of military and police products by Ministry of Internal Affairs and Administration;**
  - **Giving licenses by Ministry of National Defense to perform business connected with usage of substances stated in *Chemical Weapon Convention*;**
  - **Certification processes performed by Product Certification Body.**



## MILITARY TRAINING AREA

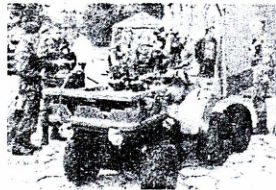
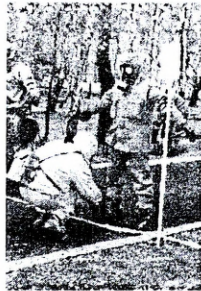
### **Purpose:**

- **Individual field training of NBC Teams with CWA or simulants.**
- **Location: 130 km North from Warsaw, guarded area.**
- **Capabilities: 20 persons per course.**
- **Protection: decon.squares, sewage neutralisation, on-site medical control, decon.tents etc.**
- **Social buildings, commercial Hotel in Przasnysz**



## MAIN EXERCISES ORGANISED BY MICRAD

1998 – NATO/SICA  
field CWA training  
on sampling,  
transportation and  
analysis of  
contaminated  
samples



## MAIN EXERCISES ORGANISED BY MICRAD

2000 – OPCW  
Investigation of  
Alleged Use of  
Chemical Weapons –  
field training





## OTHER EVENTS

- Two NATO Advanced Research Workshops;
- NATO/LG-7 Meeting
- NATO/ LTSS Meeting
- SIBCRA Meeting



## INTERNATIONAL COOPERATION IN FIELD OF NBC

- Organization for Prohibition  
of Chemical Weapons
- Vojensky Technicky Ustav Ochrany,  
Czech Republic





## **INTERNATIONAL COOPERATION IN FIELD OF NBC**

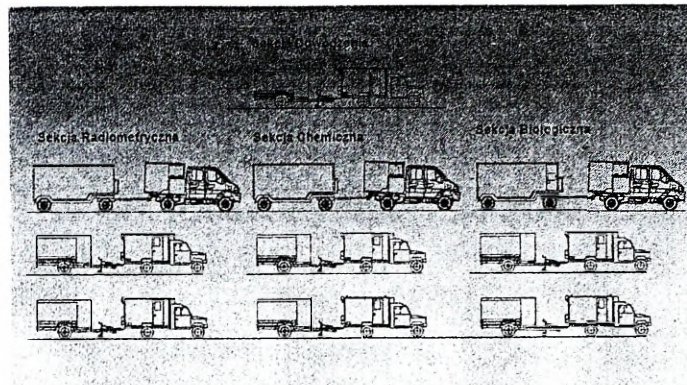
- **Vojensky Technicky Ustav,  
Slovak Republic**
  
- **National Institute of Standards and  
Technology, USA**
  
- **United Nations Monitoring and Verification  
Commission (UNMOVIC)**



## **Research Works of the Military Institute of Chemistry and Radiometry**



## Deployable NBC Laboratory Structure:



Command section.  
Radiological, Biological and Chemical Sections  
(analytical team, sampling team, logistic support team).



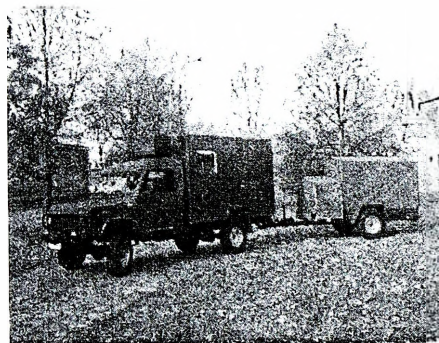
## Command Section:

### Structure:

- Honker 2000 z trailer

### Personnel:

- Commander;
- Technician;
- Technician;



### Mission:

- Managing of the organizational work of the Laboratory;
- Liason planning and maintenance;
- Making decisions concerned with the work of the Laboratory;
- Co-operation with higher level command;
- Threat assesment;
- Evaluation of the results done by chemical, biological and radiological section.



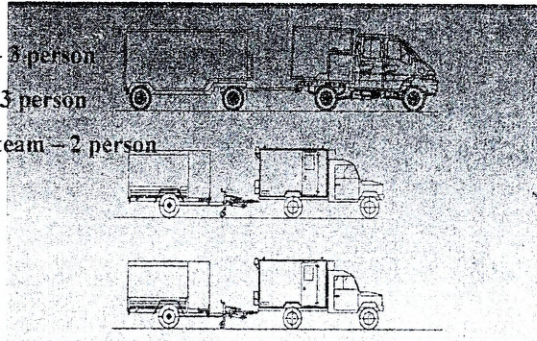
## Radiological Section

### Structure:

- Analytical team on truck SCAM SM55 with trailer
- Sampling team on the truck Honker 2000 with trailer
- Logistic support team on the truck Honker 2000 with trailer

### Personnel:

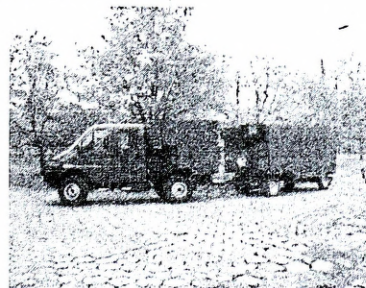
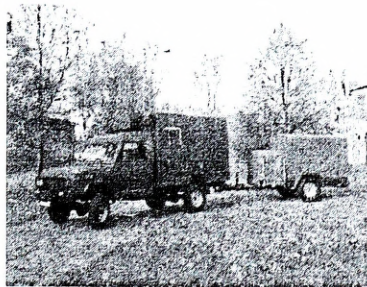
- Analytical team – 3 person
- Sampling team – 3 person
- Logistic support team – 2 person



## Radiological Section

### General view on the vehicles:

- Analytical section on the truck SCAM SM55 with trailer

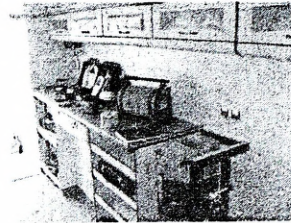
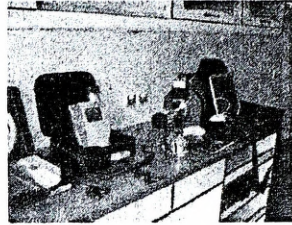
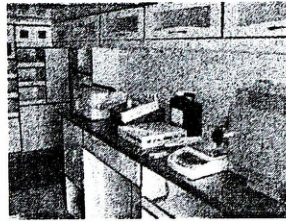
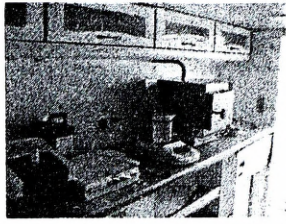


- Sampling team on the truck Honker 2000 with trailer
- Logistic support team on the truck Honker 2000 with trailer



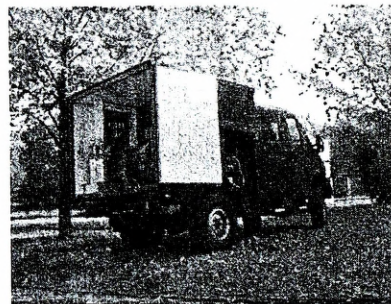
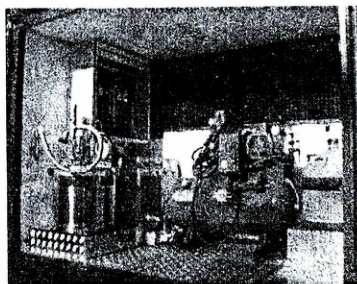
## Radiological Section

General view on the interior of the laboratory



## Radiological Section

Vehicle of an analytical team  
with supporting equipment



Liquid nitrogen plant settled in  
truck back space.



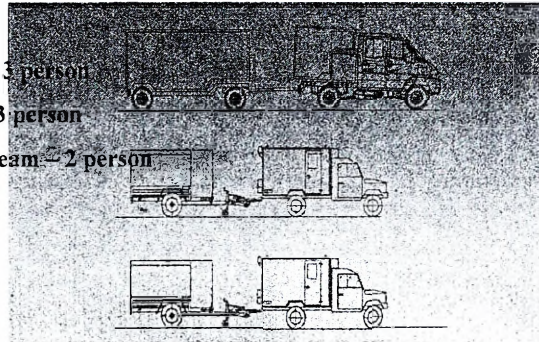
## Chemical Section

### Structure:

- Analytical team on truck SCAM SM55 with trailer
- Sampling team on the truck Honker 2000 with trailer
- Logistic support team on the truck Honker 2000 with trailer

### Personnel:

- Analytical team – 3 person
- Sampling team – 3 person
- Logistic support team – 2 person



## Chemical Section

### General view on the vehicles:

- Analytical section on the truck SCAM SM55 with trailer

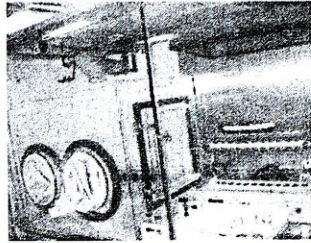
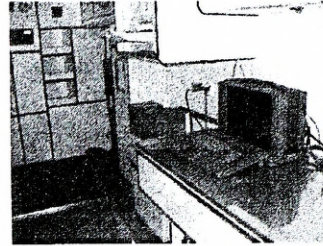
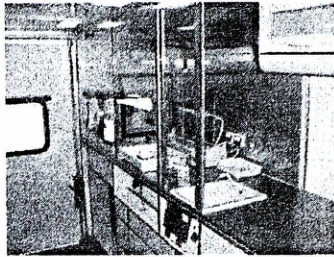


- Sampling team on the truck Honker 2000 with trailer
- Logistic support team on the truck Honker 2000 with trailer



## Chemical Section

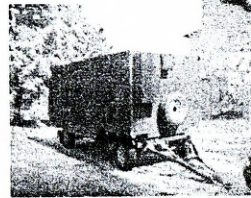
General view on the interior of the laboratory



## Biological Section

General view on the vehicles:

- Analytical section on the truck SCAM SM55 with trailer



- Sampling team on the truck Honker 2000 with trailer
- Logistic support team on the truck Honker 2000 with trailer



## Deployable NBC Sampling Set for SIBCRA System

**Application:**

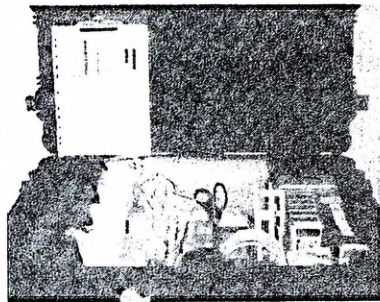
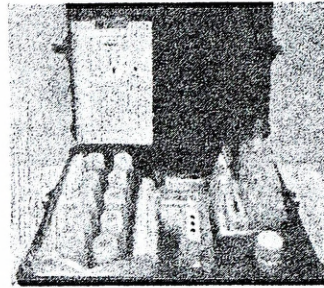
- Collection chemically, biologically and radiologically contaminated samples according to AEP-10;
- Safe delivery the samples to the analytical laboratory.



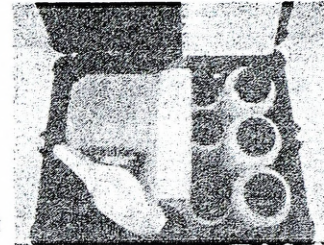
The car is equipped with filtroventilating and aircondition system.  
7,5 KW generator - 6h working without refueling.  
Decontamination cabin.  
NBC protection tent.



BIO sampling set



CHEM sampling set



RADIO sampling set



## NBC reconnaissance post

### LEVEL OF OPERATION – BATTALION

#### General features

- detection and measurement of radiation contamination
- detection and measurement of chemical contamination
- measurement of meteorological conditions
- GPS positioning
- automatic data acquisition
- warning and reporting module
  
- UKF RADIO transmission module built-in
- possible to use as NBC reconnaissance patrol

Crew – 2 soldiers



### RADIAC meter - DPO

#### General features

- measurement of X and gamma radiation dose equivalent rate and dose equivalent;
- detection and measurement of surface contamination with alpha, beta and gamma radiation emitters



#### Technical data

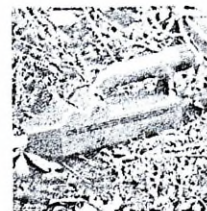
(Dose equivalent rate (DER) measurement range	0,1 $\mu$ Sv/h ÷ 50 Sv/h
Dose equivalent (DE) measurement range	1 $\mu$ Sv ÷ 100 Sv
Energy response from 65 keV ÷ 1 MeV (related to 662 keV)	± 25%
Operating temperature range:	(-50 ÷ +50) $^{\circ}$ C
Storage temperature range	(-50 ÷ +70) $^{\circ}$ C
Surface contamination measurement range from the background level up to	999 x 10 <sup>2</sup> s <sup>-1</sup>



### Chemical Agent Monitor CAM-2 Plus

#### General features

- detection and measurements of chemical warfare agents and selected toxic industry chemicals



#### Technical data

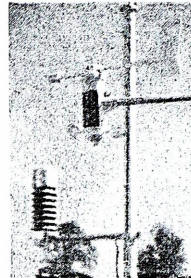
- detection nerve and blister agents
- detection selected TIC's
- visual and audible alarm
- temperature range: -30  $^{\circ}$ C to +50  $^{\circ}$ C operating  
(-50  $^{\circ}$ C to +70  $^{\circ}$ C storage)



### **Meteo station – Vega -0103**

Carries out permanent meteorological measurements necessary for NBC reconnaissance:

- ambient temperature – 2 sensors
- absolute pressure
- humidity,
- velocity and direction of wind



### **BFC-201 battlefield computer**

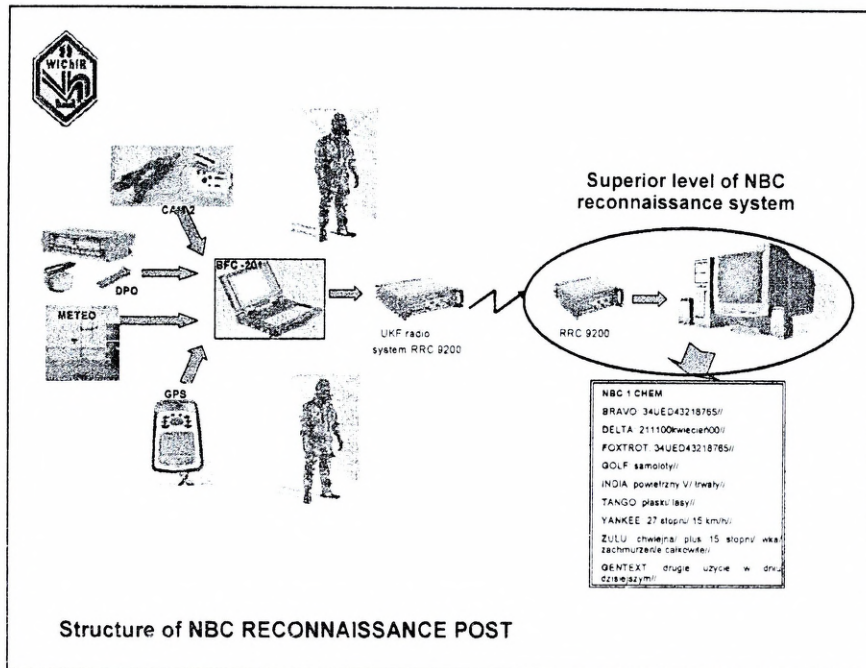
#### General features

- acquisition data from sensors and other peripheral devices
- evaluation and transmission report and data according to AEP-45, ATP-45 (B) – NATO STANAG

#### Technical data

- Processor: Pentium III
- Memory: 128 MB SDRAM
- Power supply: External 18÷36V DC  
Built-in back-up battery 12V 2.2Ah with integrated battery charger





## Light Collective Protection System

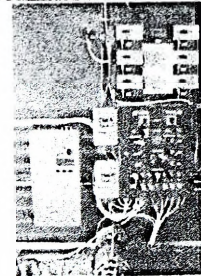
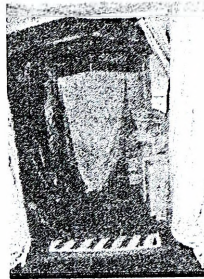
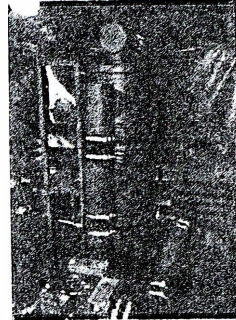
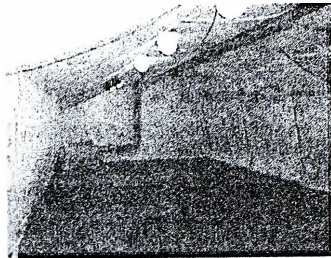
**Application:**  
 for collective protection against  
 Chemical Warfare Agents (CWA), Toxic  
 Industry Chemicals (TIC), biological  
 and radiological agents.

**Specification:**  
 Protective time - over 24 hours  
 Total weight - 600 kg (tent's part)  
 Implementation phase - in service



**Specification:**

Transportation- one 3,5t truck with trailer  
Control - automatic, manual



**Filtrating Combat Clothing**

Consists of three items: suit, gloves and overboots.  
The protective suit consists of a jacket (with integrated hood) and trousers. The material used is based on Saratoga™ composite filter fabric.  
It provides at least 24 hours protection against CWA vapors.



**NBC Poncho**

Provides protection for the individual and his equipment. It has an integrated hood which is closed with string fastener.

It provides at least 24 hours protection against CWA droplets.





### Light Protective Combat Suit

Two piece overgarment. The jacket has an integral hood with sleeve grips. The trousers include integral, double-soled overshoes. It is designed to be donned over existing clothing, including footwear.

**Application:**

In complete with gas mask for individual protection against chemical, biological and nuclear agents for Land Forces, Navy, Air Force, Military NBC Rescue Teams, SIBCRA Teams and for Civil Defence.



**Specification:**

Protection time - over 24 hours  
Total weight - 1,5 kg

In service since July '04



### BOO Protective Suit

The design comprises a one-piece coverall with boots attached. The gloves are with sleeve grips. The integral hood has a wide panoramic face-screen.

The overgarment is equipped with filtered air blower for internal ventilation.

**Application:**

For individual protection against nuclear, biological and chemical agents for Decontamination Sub-units, Military NBC Rescue Teams, SIBCRA Teams.

**Specification:**

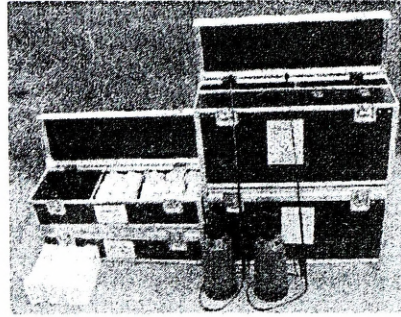
Protection time - over 12 hours  
Total weight - 11 kg  
In service



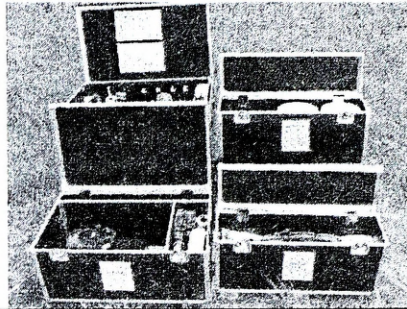


## Battalion Decontamination Set

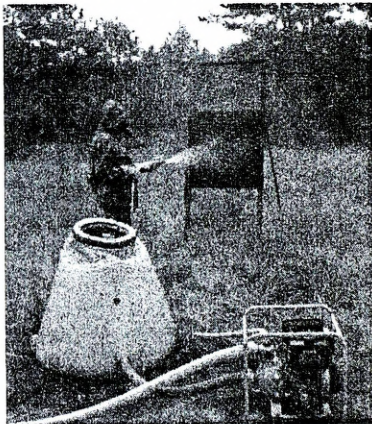
Designed for partial decontamination on battalion level.



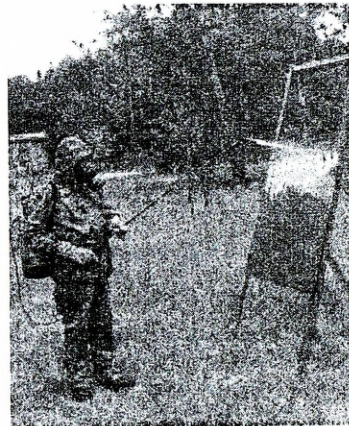
Equipment for organic decontaminant



Equipment for powder decontaminant



Washing with water



Application of universal powder decontaminant with foaming nozzle.

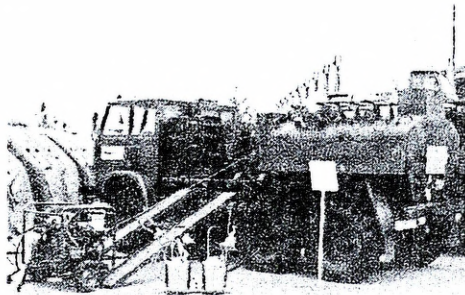


### Decontamination Installation IRS-2C

Installation IRS-2 is designed for total decontamination of:

- armament, Armored Fighting Vehicles, cars;
- buildings;
- military infrastructure – airports, harbors;

It can be used for firefighting.



### Smoke Equipment Visual and IR Screening

- smoke pot DM-2B
- smoke hand grenade RGD-3
- smoke grenade DG-7M for RPG-7 launcher
- smoke grenade WGD-2M for self covering systems
- panel smoke generator for W-3WA helicopter



## DM-2B SMOKE POT

**Application:**  
for fast smoke-screen spreading for  
concealing sub-units and armoured  
vehicles in the visual and IR.

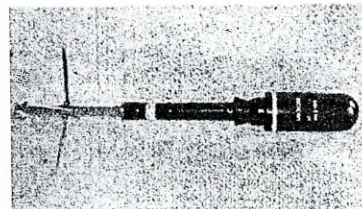
**Technical parameters:**  
weight - 2700 g  
weight of smoke mixture - about 2000 g  
time of smoke-screen spreading – over  
80 s  
smoke-screen size – over:  
100x8 m (visual),  
15x4 m (IR)



## DG-7M ROCKET SMOKE GRENADE FOR RPG-7 LAUNCHER

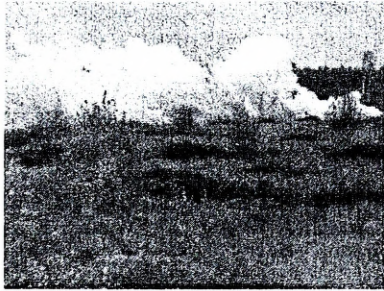
**Application:**  
for fast smoke-screen spreading for  
concealing small troops after noticing  
enemy observation posts, countering  
observation in the visual and IR.

**Technical parameters:**  
weight - 3.0 kg  
weight of smoke mixture - 1.5 kg  
time of smoke-screen spreading – over 2 min  
maximum shooting distance - up to 1600 m  
smoke-screen size – over:  
80x3 m (visual), 15x2,5 m (IR)

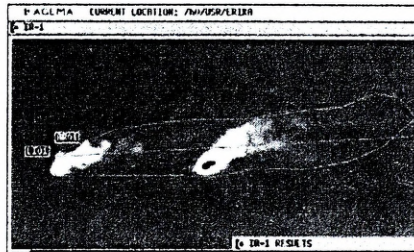




## DG-7M ROCKET SMOKE GRENADE FOR RPG-7 LAUNCHER



Visual smoke screen



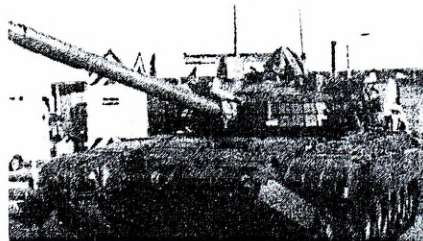
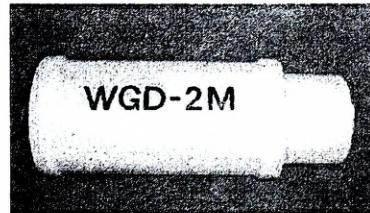
IR screen



## WGD-2M SMOKE GRENADE

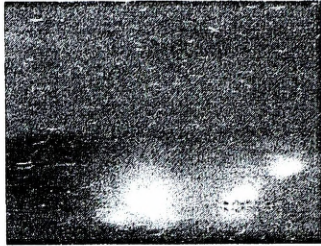
**Application:**  
for fast smoke-screen spreading  
on receiving information about  
laser radiation of fighting vehicle

**Technical parameters:**  
weight – 1030 g  
weight of smoke mixture - 600 g  
time of smoke-screen spreading  
– over 8 s  
smoke-screen size – over 40 m<sup>2</sup>

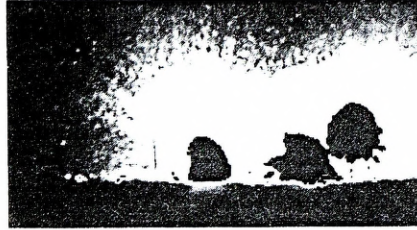




## WGD-2M SMOKE GRENADE



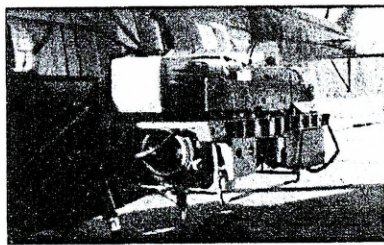
Visual screen - volley of 3 grenades.



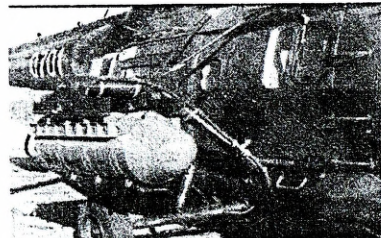
IR screen - volley of 3 grenades.



## PANEL SMOKE GENERATOR



PWD smoke generator mounted on W-3WA helicopter.



Container with smoke agent mounted on W-3WA helicopter.



## PANEL SMOKE GENERATOR

### Smoke agent type:

- ♦ oil with optically active substances for screening in visual and IR bands;

- ♦ pure oil (soja oil) for visual screening;

Working time with maximum yield – about 12 min;

### Meteorological conditions:

- ♦ atmospheric temperature from  $-10$  to  $+50^{\circ}\text{C}$ ,

- ♦ wind speed up to 8 m/s;

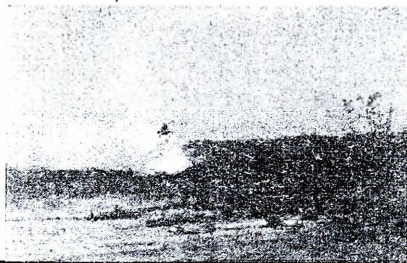
Starting time – max. 90 s;

Screen lasts in visual range – min. 3 min;

### Cloud characteristics:

- ♦ length – about 10 km;

- ♦ area – about  $0,24 \text{ km}^2$ .



## GROUND SMOKE GENERATOR

(model)



60547

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