

PREPAREDNESS OF FIRE AND RESCUE SERVICE OF THE CZECH REPUBLIC FOR CBRN THREATS

Michal SETNIČKA
michal.setnicka@ioolb.izscr.cz

Abstract

The Czech Republic has established Integrated Rescue System for crisis management. An integral part of this system is the Fire and Rescue Service of the Czech Republic, which plays a key role in this system because firefighters have the position of officers in charge. Moreover, the Fire and Rescue Service is also responsible for the Civil Protection, which also includes protection against CBRN hazards. Originally, firefighters were mainly focused on industrial and traffic incidents connected with the leakage of chemicals. However, after several dangerous terrorist attacks across the world, tasks and equipment of the FRS CR needed to be updated to cover all CBRN threats.

Key words

CBRN incident, Integrated Rescue System, Fire and Rescue Service of the Czech Republic.

Integrated Rescue System

Primary mission of the Fire Rescue Service (FRS) of CR is to protect the lives and health of citizens, environment, animals and property against fires and other emergencies and crisis situations [1]. In case of a chemical, biological, radiological and nuclear (CBRN) threat, the role of the FRS has been crucial since 2001 when Act No. 239/2000 Coll. for the Integrated Rescue System (IRS) began to apply [2]. IRS is not an organization but a coordinated process of its units in planning and preparing for emergencies and carrying out rescue and recovery operations. Basic bodies of the IRS are the FRS, Police and Emergency Medical Service, and they operate on a 24/7/365 basis throughout the whole country. If necessary, the main units collaborate with other bodies of the IRS, such as the army, Red Cross, etc. The Act also transferred activities and responsibilities for the Civil Protection from the Ministry of Defence to the Ministry of Interior and then directly to the FRS CR. The FRS plays a key role in the IRS, because firefighters have the position of officers in charge not only for fires but also for most of other threats including CBRN incidents. In the beginning, firefighters were mainly focused on industrial and traffic incidents connected with the leakage of chemicals. However, after several dangerous terrorist attacks across the world, tasks and equipment of the FRS CR needed to be updated to cover all CBRN threats.

CBRN incident

Dealing with a CBRN incident, threat or suspicion is always very complicated and potentially dangerous. All Czech firefighters are properly equipped for such type of an incident across the country (for example personal protective equipment, detectors, and other skills). Only a few special units of Police, Emergency Medical Service and the army have similar equipment and skills.

The most important tasks for firefighters in case of a CBRN incident are: providing first aid to disabled people, detection and confirmation of CBRN risk, timely population

warnings, identification of hazardous materials, determination of contamination degree, demarcation of contaminated areas, decontamination, rescue and evacuation of population and recovery operations.

CBRN solution tactics

At small events, firefighters proceed according to operational orders of the FRS CR. These are guidelines for firefighters in individual situations such as an oil leakage, ADR accident or ammonia leakage etc. If necessary, firefighters cooperate with other bodies of the IRS and the activities are coordinated on a strategic level through the mechanisms of the Act on the IRS. The firefighters who are the officers in charge manage activities at a tactical level. In addition to the Act, the IRS and FRS has agreements on mutual assistance with other governmental bodies as well as NGOs. For example, FRS cooperates with the State Office for Nuclear Safety with regards to radiation protection and chemical warfare agents (CWA); with the Ministry of Health over human B-agents; with the State Veterinary Administration for animal B-agents etc. For larger incidents or attacks where it is necessary to coordinate multiple bodies of the IRS, we have prepared joint Standard Operation Plans (SOP). Currently we have SOPs related to CBRN risks for the case of a Terrorist Attack when using of Dirty Bomb, Finding an object suspected of having B-agents or toxins, Chemical Warfare Agents in Prague Metro and Avian Influenza.



photo: Leoš Kučera

Figure 1
Exercise – terrorist attack in Prague metro

Structure of Fire and Rescue Service of the Czech Republic and their equipment for CBRN incident

FRS consists of the General Directorate of FRS (part of the Ministry of Interior), 14 Regional Fire Rescue Services and the Emergency Unit.

In relation to CBRN risks, especially detection of chemicals and radiation, professional fire units are divided into four levels according to their location and equipment [3, 4]:

- 173 Basic Level Fire Units (BLs) are fire brigades in smaller towns that have only basic equipment (violet circles in Figure 2).
- 60 Middle Level Fire Units (MLs) situated in district towns (green squares in Figure 2).
- 12 Strong Point Level Fire Units (HAZMAT Teams) are situated in large regional cities (red circles in Figure 2).
- 5 Chemical Laboratories (Analytical Tasks Forces) which serve for more complex situations that are equally spread on the territory of Czech Republic and not only have mobile detectors and analysers but also a well equipped stationary laboratory (black bordered yellow squares in Figure 2).
- 3 Emergency Units with special equipment to population protection and intervening units during CBRN events (blue bordered orange triangles in Figure 2).

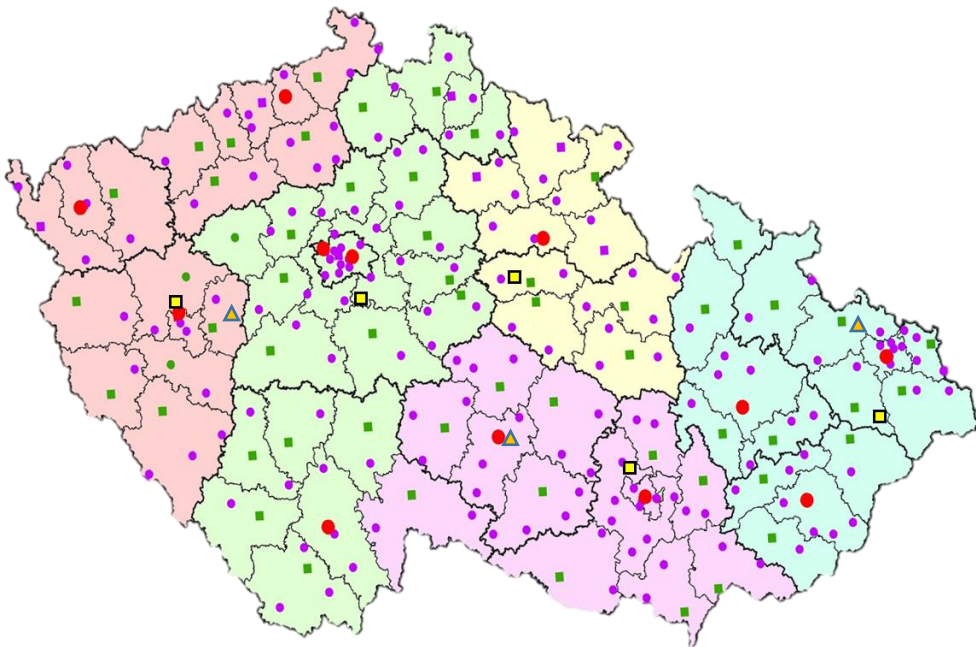


Figure 2
Location of fire protection units

Basic Level Fire Units (BLs)

BLs are equipped with detectors containing simple detection kits like detection tubes (e.g. CH-71) for toxic industrial compounds (TIC) and CWA and detection papers (Detehit, PP3) designed to detect the presence of CWA. Further, the BLs have some detection instruments for oxygen determination and explosimeters (e.g. GasAlert). For RN incident the

BLs are equipped with personal (SOR/R022) and operational (Ultra-Radiac) dose meters and radiometers (DC-3E-98 or DC-3H-08) which are designed to measure dose rate of gamma ionizing radiation, to detect beta ionizing radiation and to measure surface activity (contamination) caused by radioactive particles. These units are on the scene in less than 20 minutes after receiving an emergency call almost anywhere in Czech Republic.

Middle Level Fire Units (MLs)

MLs are equipped with the same equipment like BLs but in larger amounts. For example, MLs have 3 pcs of the personal dose meters and 3 pcs of radiometers. Next oximeters and explosimeters MLs have also 3-4 electrochemical sensors for TICs detection and some MLs also have a photoionization detector (PID) which measures with sensitivity in ppm. If necessary, these units support BLs. They are on the scene in 40 minutes in maximum (the time depends on the distance of unit from the place of incident).

Strongpoint Level Fire Units (SLs)

SLs are equipped with the same equipment like MLs but again in larger amounts (e.g. 10 pcs of personal dose meters). For the most common chemical incident, SLs have a portable Raman's spectrometer (FirstDefender) and FTIR spectrometer (TrueDefender) for solid and liquid hazmat identification. The spectrometers contain the vast library of CWA, explosives, TICs, volatile organic compounds, narcotics, white powders etc. For hazardous gases and vapours identification, SLs are also equipped with a portable analyzer GDA-2. These units support lower ones and they are on the scene after 80-120 minutes in dependence the distance of unit from the place of incident.



photo: author

*Figure 3
Exercise – decontamination of firefighters*

Chemical Laboratories (CHL)

CHL support fire units not only in stationary labs, but also on scene. They provide chemical and radiation monitoring, identification, sampling or information support on hazmat

[5]. CHL are equipped with devices using various analytical principles: gas chromatography equipped with mass spectrometer detection (GC/MS), Fourier-transform infrared spectroscopy (FTIR) and Raman's spectrometry, X-ray, atomic absorption spectroscopy (AAS), fluorescence, spectrophotometry, ion-mobility spectrometry (IMS), PID which measures from 1 ppb, electrochemical sensors. Moreover, the CHL of Population Protection Institute (part of General Directorate of FRS) dispose with infrared stand-off detector SIGIS (Scanning Infrared Gas Imaging System). This device is most often used for monitoring large high visible events. Rad devices are used in any field application requiring dose rate, surface activity and contamination measurements, searching source of ionizing radiation, in situ or mobile monitoring and nuclide identification. All CHL are a part of Radiation Monitoring Net of the Czech Republic collecting data for the State Office for Nuclear Safety. Next to chemistry and radiation, CHL have also some simple bio-detection capabilities. First step biological/nonbiological (Biocheck) and second step based on immunochromatography (Miprotect). In the case of a justified suspicion of B-agents CHL cooperate with the Population Protection Institute (PPI) which have field polymerase chain reaction device (FilmArray) for more accurate detection. All samples are sent to the National Institute for Nuclear, Chemical and Biological Protection for identification in laboratory operated in the highest biosafety level (BSL-4). CHL are further equipped with a mobile chemical and radiological laboratory with digester. These vehicles are designed to carry out on scene detection (in field or on the run) and inside the mobile lab. By the way, we are able to safely transport a radioactive source with equivalent 1 TBq of ^{137}Cs in this vehicle. Last equipment that is located in each laboratory is Gas-tight plenum chamber for the transport of dangerous or unknown pressure cylinders.



photo: author

Figure 4
Exercise – workers from chemical laboratory after radiation survey



photo: archive of JmK

Figure 5
Gas-tight plenum chamber for the transport of dangerous cylinders

Gamma radiation monitors

For events where a large number of persons contaminated by radioactive particles is expected (e.g. nuclear power plant accident), the FRS has gamma radiation portal monitors. It serves for fast contamination control of persons and vehicles and categorizing them into “clean” and “dirty”. It is constructed as a fully adjustable set with two (people) to six (truck) detectors. This equipment is dislocated in emergency planning zones of our nuclear power plant and also at Emergency Units.

Decontamination equipment

We use mobile decontamination lines, which usually consists of three sections (undressing, shower and drying part incl. a dressing room). The system is simple to assemble and disassemble. A group of five trained people can start decontamination in 15 minutes after arrival on the scene. We understand the term of decontamination as a process of elimination hazmat risks. It is not seen as an absolute solution for the contamination. Decontamination lines for mass decontamination are also equipped with facilities for decontamination of injured people. Each Regional Fire Rescue Services and Emergency Unit have an available decontamination line for mass decontamination (together we have 21 pieces (7 of these for injured people)). In addition to mass decontamination of people, Emergency Units have six vehicle decontamination lines, which are designed as a mobile car wash. This line is operated via a remote control system, which can start operation in 60 minutes after arrival on the scene. All waste after decontamination are captured and safely liquidated. Special cistern trucks to transport this dangerous waste are dislocated at Emergency Units.



photo: Pavel Pech

Figure 6
Decontamination lines for population decontamination

Training

Training is an important and essential part of our preparedness to CBRN events. It is important to have not only well-educated tutors, but also knowledge of competent candidates for training. Basic training for Firefighter - Chemist is carried out in fire schools. Trainings that are more specialized are organized by the PPI with cooperation of personnel in CHL. The specialized courses are mainly Radiation protection, Detection, monitoring and sampling of dangerous chemicals, Principles of intervention on scene with presence of CWA and Decontamination. These training courses are particularly focused on CBRN risks, activities not only relate to skills and technology, personal protective equipment or other means of handling contamination, but also to improving best practice and good automatism, for instance in activities at the area of the hot zone. Moreover, FRS participates in a number of national and international (e.g. EU MODEX, NCT PRO Training) CBRN exercises.

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