

## Better Preparedness and Protection of Passengers against Chemical Terrorism in the Prague Metro

Otakar Jiri Mika<sup>1,2</sup>  
Jiri Patočka<sup>3</sup>

The CBRN incidents are on the rise and there is a need for clear understanding of threats, vulnerabilities and modus operandi for reliable prevention and fast and effective response. Managing CBRN incidents, all prevention, preparedness and response, are multi-agency affairs seeking fine coordination and clear understanding of rules and jurisdictions. Any response needs to be speedy and coordinated to avert casualties and prevent escalation.

Chemical terrorism is a serious security threat not only in the Czech Republic, but all over the world. Its imminence and danger are given by many different facts such as the previous experience of actual chemical attacks (Japan 1994 and 1995), the appearance of new terrorist groups, changes, and reactions to political changes, growing national minorities even in the Czech Republic, religious fanaticism, many more reasons, etc.

The Czech Republic has developed a unique crisis plan for all components of the Integrated Rescue System (IRS), the so-called Type Activity. Type activity No. 13 was prepared for more than 3 years as an inter-ministerial meeting at the highest level. It has an official title: *Reaction to a chemical attack in the Metro* and counts a total of 108 pages of professional text, this material is not public.

The standard activities of the IRS units during a joint intervention (hereinafter referred to as “*type activities*”) are processed in accordance with Section 18 of Decree No. 328/2001 Coll. of 5 September 2001 on certain details of IRS security, as amended by Decree No. 429/2003 Coll. Type activities are issued by the Ministry of the Interior - General Directorate of the Fire and Rescue Service of the Czech Republic, Department of IRS and Service Performance.

Many practical tests implemented in the Prague underground showed how to prepare and protect passengers against threats and effects of chemical terrorism. Passenger lifesaving, protection of their health and safe transport represent permanent priorities of the Prague Public Transit Company. The Prague tube passengers are to be informed about the threat of a possible chemical attack in a suitable way. They will also be shown simple and effective protections against a possible chemical attack.

Travelling comfort and a high level of security of the tube passengers will be enhanced by their awareness of the new thorough emergency response plan that organizes all the essential activities after a possible attack and also by their consciousness of outstanding preparedness of rescue bodies.

**Keywords:** chemical terrorism, chemical weapons, chemical warfare agents, toxic industrial chemicals, prevention, preparedness, protection.

---

<sup>1</sup> Police Academy of the Czech Republic in Prague, Faculty of Security Management, Lhotecká 559/7, P.O. Box 54, 143 01 Praha 4, Czech Republic, email: [mika@polac.cz](mailto:mika@polac.cz)

<sup>2</sup> University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, J. Boreckého 1167/27, 370 11 České Budějovice, Czech Republic, email: [otakar\\_mika@email.cz](mailto:otakar_mika@email.cz)

<sup>3</sup> University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, J. Boreckého 1167/27, 370 11 České Budějovice, Czech Republic, [toxocology@toxicology.cz](mailto:toxocology@toxicology.cz)

## I. Introduction

The CBRN incidents are on the rise and there is a need for clear understanding of threats, vulnerabilities and modus operandi for reliable prevention and fast and effective response. Managing CBRN incidents, both prevention and response, is a multi-agency affair seeking fine coordination and clear understanding of rules and jurisdictions. Any response needs to be speedy and coordinated to avert casualties and prevent escalation.

The CBRN crisis prevention and consequence management should be based on the following nine focus areas with each area integrating scientific research, development, advanced planning, technology implementation and advanced training in real conditions:

- 1) Prevention
- 2) Preparedness
- 3) Detection
- 4) Surveillance
- 5) Response
- 6) Rescue
- 7) Mitigation
- 8) Decontamination
- 9) Recovery<sup>4</sup>

The Czech Government and authorities consider security problems to be crucial issues of interior policy. The government and the authorities of the Czech Republic consider security issues to be key issues in domestic policy, including the threat of terrorism. Terrorism takes many forms, and although the Czech Republic has not yet seen any major terrorist act, it cannot be seen that the latest terrorist attacks are increasingly approaching the Czech border. It is therefore necessary to constantly work on protection against terrorism and, above all, to protect critical infrastructure objects.

The Prague Metro is such an object. Every subway has long been the optimal target for terrorists, in which a large number of people are constantly moving. The closed metro system is an easy target for terrorists, as demonstrated in 1995 by the Japanese terrorist organization Aum Shinrikyo's attack on the Tokyo metro by sarin, which caused 13 deaths and nearly 7,000 injuries.<sup>5,6</sup> Also, a bomb attack in St. Petersburg, Russia in 2017, which had 15 victims and seventy people suffered injuries, showed how vulnerable the subway is. That is why it is important for the Czech Republic to seriously consider protection against chemical terrorism in the Prague Metro.

The CBRN terrorism and protection against it have been thoroughly focused on by the Czech Government and authorities very frequently.<sup>7</sup> Means of public transport, especially the Prague tube, represent sites potentially threatened by a terrorist attack. There is just one tube in the Czech Republic which is located in Prague (the Capitol). The Prague subways serves three lines, green, red and yellow ones.

The preparation of the so-called Type Action for the Integrated Emergency (Rescue) System on chemical terrorism and passenger protection and its consequences lasted two years with the active participation and cooperation of several ministries. The Ministry of the Interior, the

---

<sup>4</sup> Athavale R. (2020) *Practice makes perfect*, Chemical, Biological and Nuclear Warfare (United Kingdom), No. 1, 2020, ISSN 2051-6584, pp. 26-28, p. 26.

<sup>5</sup> Tu A.T. (2002) *Chemical Terrorism: Horrors in Tokyo Subway and Matsumoto City*. Alaken, Colorado. ISBN-13: 978-1880293102

<sup>6</sup> Tu A.T. (2018) *Chemical and biological Weapons and Terrorism*. CRC Press, Taylor and Francis Group. ISBN-13: 978-1-138-03338-2.

<sup>7</sup> Patočka J. Terorismus a moderní chemie. *Vesmír* 2011, 90 (6), 324.

Ministry of Transport, the Ministry of Health, the Ministry of Defence, the State Office for Nuclear Safety, etc. participated in the project.<sup>8,9</sup>

## II. Possible Chemical Terrorism in the Prague Metro

The vulnerability of the Prague subways to chemical terrorist acts was proved in the 1995 Tokyo tube sarin attack. Even if many common chemical warfare and also toxic industrial compounds can be misused, major attention is paid to possible use of nerve agents like sarin, cyclosarin, soman, and tabun.<sup>10</sup>

Unfortunately, toxic industrial compounds with suitable physical-chemical properties and high toxicity can also be misused in terrorist attacks in tube.<sup>11</sup>

Fortunately, a very poor quality of sarin, which contained only 30% active substance, was abused in the Tokyo subway. This liquid mixture smelled very much and thus actually alerted the vulnerable subway passengers that something abnormal was happening. According to a police investigation report, 4460 people were affected, 12 of which were fatal. (National Japanese Police Agency, 1995) The numbers of heavy, moderate and light sarin poisoning are quite different according to the source of information.

The list of easy to misuse chemical substances comprises compounds such as phosgene, phosphine, chlorine, hydrogen chloride, hydrogen sulphite, and carbon disulphide. Huge amounts of toxic industrial compounds are stored in plants and transported throughout the Czech Republic, mainly by road and rail. They can be stolen and easily used by terrorists to implement chemical attacks.<sup>12</sup> The best example is the use of chlorine as a poisonous gas by Syrian rebels; chlorine is readily available compound for sterilization of water in pool and in water purification plant.

Possible scenarios of a chemical terrorism in the Prague tube have been elaborated to install preventive, repressive, protective, liquidation, rescue and recovery measures. Nevertheless, modelling propagation of hazardous chemical toxic substances in the tube with its specific air flow is very difficult. In the Czech Republic, tests and experimental measurements of contaminant proliferation were implemented by using safe simulation substances. The use of air conditioning system supports the propagation of a distributed toxic substance.<sup>13, 14</sup> Some special and sensitive results of the experiments have not been made public.

---

<sup>8</sup> Anonym (2013) STC13/IZS *"Reakce na chemický útok v metru"*; Ministerstvo vnitra České republiky, Generální ředitelství Hasičského záchranného sboru ČR, Praha 2013.

<sup>9</sup> Hanuška, Z. (2014) *Typová činnost "Reakce na chemický útok v metru"*. Proceedings of the MEKA conference, 6. února 2014, Brno. ISBN 978-80-7385-142-2; ISSN 1803-7372

<sup>10</sup> Mika O. J., Fišerová L. (2011) *Brief overview of chemical terrorism and its consequences*. Toxin Review. 2011, 1-7, Early Online. ISSN 1556-9551 online.

<sup>11</sup> Mika O. J., Fišerová L. (2011) *Brief overview of chemical terrorism and its consequences*. Toxin Review. 2011, 1-7, Early Online. ISSN 1556-9551 online.

<sup>12</sup> Mika O. J., Fišerová L. (2011) *Brief overview of chemical terrorism and its consequences*. Toxin Review. 2011, 1-7, Early Online. ISSN 1556-9551 online.

<sup>13</sup> Klouda K. at el. (2007) *Information about the course of modelling the spread of chemical agents in the metro station*. In 16<sup>th</sup> International conference "Fire Protection 2007" conference proceedings, Ostrava, 2007. pp. 228-238. ISBN 978-80-7385-009-8.

<sup>14</sup> Klouda K. at el. (2011) *Propagation of the Substituent Poisonous Matter after his Release into Waggon of the Underground*. In 20<sup>th</sup> International conference "Fire Protection 2011" conference proceedings, Ostrava, 2011, pp. 129-133, ISBN 978-80-7385-102-6.

### III. How to Respond to a Chemical Terrorism Attack in Tube

In July 2013, a completely new type of the emergency response plan to a chemical terrorism act was put into operation in the Czech Republic.<sup>15</sup> This 108-page emergency management plan of response to an attack in the tube has not been published since it is subject to concealment. The directive was compiled after implementation of many simulation experiments with proliferation of contaminants in the tube. Implementation of the above model tests is regarded as unique within Europe. Strong air flow shows special effects, like so called piston effect, which is pushing air by train movement in the tunnel. Use of ventilation systems and shafts are considered the crucial factors in proliferation of contaminants in the tube.<sup>16, 17, 18</sup>

The above new directive in response to a chemical attack in the tube provides detailed information on a possible act of chemical terrorism in the Prague tube and on recovery of its operation. It specifies response activities of individual components of Integrated Emergency System (IES) such as the Fire Rescue Service, the Medical Rescue Service, the Czech State Police and other state rescue bodies. The emergency plan also gives details on their mutual collaboration in rescue operations and other instructions for a successful intervention after chemical attack including delivery of information to tube passengers and to people outside the tube. The emergency response plan can save hundreds to thousands of lives and protect the health of possible victims of a terrorist attack in the subways.<sup>19</sup>

Many authorities and bodies such as Ministries of Interior, Health, Defense, The State Office for Nuclear Safety and other institutions participated in preparation of the emergency response directive. Firstly, a basic concept of passenger rescue, decontamination and first aid was elaborated by the Fire Rescue and First/Aid Services and then it was completed based on discussions with experts from the Czech State Police, the Czech Army, and the Prague Municipal Government and with forensic medicine specialists. Results of experiments and tests with simulated propagation of suitable chemical substances in the Prague tube were also considered. Naturally, the emergency directive is built on theoretical background, thorough safety study and literature search.

An important step in the verification of the entire emergency response plan was extensive exercises in the premises of the Anděl metro station in October 21-22, 2014. They participated in all the main components of the Integrated Emergency System. The total number of participants was more than 800 persons, and 130 pieces of special equipment. The screening exercise showed many positives and good preparedness of all Integrated Emergency System units, on the other hand, many shortcomings and reserves were also shown, some of which were also published.<sup>20</sup> A total of five major hospitals in Prague were included in the rescue of the affected persons. There can also be no doubt that some sensitive shortcomings and downright errors, from training, through material equipment to the necessary coordination of rescue work,

---

<sup>15</sup> Anonym (2013) STC13/IZS "*Reakce na chemický útok v metru*"; Ministerstvo vnitra České republiky, Generální ředitelství Hasičského záchranného sboru ČR, Praha 2013.

<sup>16</sup> Hanuška, Z. (2014) *Typová cinnost "Reakce na chemický útok v metru"*. Proceedings of the MEKA conference, 6. února 2014, Brno. ISBN 978-80-7385-142-2; ISSN 1803-7372.

<sup>17</sup> Klouda K. at el. (2007) *Information about the course of modelling the spread of chemical agents in the metro station*. In 16<sup>th</sup> International conference "Fire Protection 2007" conference proceedings, Ostrava, 2007. pp. 228-238. ISBN 978-80-7385-009-8.

<sup>18</sup> Klouda K. at el. (2011) *Propagation of the Substituent Poisonous Matter after his Release into Waggon of the Underground*. In 20<sup>th</sup> International conference "Fire Protection 2011" conference proceedings, Ostrava, 2011, pp. 129-133, ISBN 978-80-7385-102-6.

<sup>19</sup> Hanuška, Z. (2014) *Typová cinnost "Reakce na chemický útok v metru"*. Proceedings of the MEKA conference, 6. února 2014, Brno. ISBN 978-80-7385-142-2; ISSN 1803-7372

<sup>20</sup> Klegr O., Křen J. (2015) *Taktické cvičení Metro 2014*. časopis 112, číslo 3, str. 16-18, ISSN 1213-7057.

are used only within the system. After the analysis and evaluation of the exercises, the whole set of questions will be used to further improve the system in all possible aspects.

A large verification exercise took place in October 2014, and another major professional verification exercise is currently under preparation. It is important to set up facility to make immediate response for terrorist action. One should set up a storage place for drugs, medical tools, and miscellaneous rescue equipment such as gas masks, gloves, and tents intended for decontamination of victims. It is also important to identify the toxic agent as soon as possible so that proper treatment can be made.

With the rapid development of science and technology, with better technical equipment, the readiness of the Integrated Emergency System components for possible chemical attacks is generally significantly improved, but on the other hand, attackers can also have higher scientific knowledge, a modern modeling SW tool that easily allows them to misuse chemical warfare agents or industrial toxic compounds very effectively and dangerously. It must be borne in mind that the number of possible toxic chemicals that can be used in a terrorist attack is wide, as is the spectrum of clinical signs.<sup>21, 22</sup>

#### IV. Conclusion

Chemical terrorism is a serious security threat not only in the Czech Republic, but all over the world. Its imminence and danger is given by many different facts such as the previous experience of actual chemical attacks (Japan 1994 and 1995), the appearance of new terrorist groups, changes, and reactions to political changes, growing national minorities even in the Czech Republic, religious fanaticism, etc.

Many practical tests implemented in the Prague tube showed how to protect passengers against threats and effects of chemical terrorism.<sup>23</sup> Passenger lifesaving, protection of their health and safe transport represent permanent priorities of the Prague Public Transit Company. The Prague tube passengers are to be informed about the threat of a possible chemical attack in a suitable way. They will also be shown simple and effective protections against a possible chemical attack.

Travelling comfort and a high level of security of the tube passengers will be enhanced by their awareness of the new thorough emergency response plan that organizes all the essential activities after a possible attack and also by their consciousness of outstanding preparedness of rescue bodies.

Concerning the victims of terrorist attacks, these are not only direct victims, dead and wounded persons, but also indirect victims including the families and friends of the victims, and the wider informed public. It is the informed public on which, through the media, the present terrorists count on when planning their atrocities to be very brutal to shock the entire public to draw attention to their requirements, attitude to a political situation, etc. Several special cases of chemical terrorism have been described in the work of Professor Anthony T. Tu from the United States<sup>24, 25</sup>, which is considered one of the best experts in the field.

---

<sup>21</sup> Patočka J., Fusek J. *Chemical agents and chemical terrorism*. *Cent Eur J Public Health* 2004, 12 (Suppl), 575-777, doi: 10.21101/cejph.b0080

<sup>22</sup> Patočka J., Kuča K., Dohnal V., Jun D. *Chemický terorismus*. *Kontakt* 2006, 1, 123-127. doi: 10.32725/kont.2006.020

<sup>23</sup> Schullerová B. et al. (2014): *Threat of chemical terrorism in the underground*. Safety Engineering Series, Vol. IX, No. 2. ISSN 1801-1764.

<sup>24</sup> Tu A.T. (2018) *Chemical and biological Weapons and Terrorism*. CRC Press, Taylor and Francis Group. ISBN-13: 978-1-138-03338-2.

<sup>25</sup> Tu A.T. (2020) *The use of VX as a terrorist agent: action by Aum Shinrikiyo of Japan and the death of Kim Jong-Nam in Malaysia: four case studies*, *Global Security: Health, Science and Policy*, 5:1, 48-56.

Chemical terrorism, which can bring about unfathomable and catastrophic consequences, must be counted to this category, too.

The contribution was financially partially supported by the scientific and research project of the Ministry of the Interior of the Czech Republic No. VI20192022171.

## V. References

- Anonym (2013) STC13/IZS "Reakce na chemický útok v metru"; Ministerstvo vnitra České republiky, Generální ředitelství Hasičského záchranného sboru ČR, Praha 2013.
- Athavale R. (2020) *Practice makes perfect*, Chemical, Biological and Nuclear Warfare (United Kingdom), No. 1, 2020, ISSN 2051-6584, pp. 26-28, p. 26.
- Hanuška, Z. (2014) *Typová cinnost "Reakce na chemický útok v metru"*. Proceedings of the MEKA conference, 6. února 2014, Brno. ISBN 978-80-7385-142-2; ISSN 1803-7372
- Klegr O., Křen J. (2015) *Taktické cvičení Metro 2014*. časopis 112, číslo 3, str. 16-18, ISSN 1213-7057.
- Klouda K. at el. (2007) *Information about the course of modelling the spread of chemical agents in the metro station*. In 16<sup>th</sup> International conference "Fire Protection 2007" conference proceedings, Ostrava, 2007. pp. 228-238. ISBN 978-80-7385-009-8.
- Klouda K. at el. (2011) *Propagation of the Substituent Poisonous Matter after his Release into Waggon of the Underground*. In 20<sup>th</sup> International conference "Fire Protection 2011, conference proceedings, pp 129-133, ISBN 978-80-7385-102-6.
- Mika O. J., Fišerová L. (2011) *Brief overview of chemical terrorism and its consequences*. Toxin Review. 2011, 1-7, Early Online. ISSN 1556-9551 online.
- National (Japanese) Police Agency (1995). AUM SHINRIKYO, An alarming report on the group's organization and activities, *Shoten (Tokyo)* 1995, 252, 10-12.
- Patočka J., Fusek J. Chemical agents and chemical terrorism. *Cent Eur J Public Health* 2004, 12 (Suppl), 575-777, doi: 10.21101/cejph.b0080
- Patočka J., Kuča K., Dohnal V., Jun D. Chemický terorismus. *Kontakt* 2006, 1, 123-127. doi: 10.32725/kont.2006.020
- Patočka J. Terorismus a moderní chemie. *Vesmír* 2011, 90 (6), 324.
- Schullerová B. at el. (2014): *Threat of chemical terrorism in the underground*. Safety Engineering Series, Vol. IX, No. 2. ISSN 1801-1764.
- Tu A.T. (2020) *The use of VX as a terrorist agent: action by Aum Shinrikiyo of Japan and the death of Kim Jong-Nam in Malaysia: four case studies*, *Global Security: Health, Science and Policy*, 5:1, 48-56.
- Tu A.T. (2002) *Chemical Terrorism: Horrors in Tokyo Subway and Matsumoto City*. Alaken, Colorado. ISBN-13: 978-1880293102
- Tu A.T. (2018) *Chemical and biological Weapons and Terrorism*. CRC Press, Taylor and Francis Group. ISBN-13: 978-1-138-03338-2.