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FURTHER DEVELOPMENT OF ESTIMATING PROCEDURES OF THE CHEMICAL AND RADIOLOGICAL SITUATION ANALYSIS

Author's booklet
of PhD Dissertation

Budapest, 2010

I. Background, aims

As it is known the estimation of nuclear situation is completed in HDF with the aid of documents ATP-45(D) and AEP-45(C) brought into service in NATO Armies. The two NATO estimation guides provide fast operational appreciation of NBC situation with few input data therefore resulting very conservative estimation. This estimation system covers analysis of consequences resulting by conventional using Weapons of Mass Destruction or accidents on industrial objects but there are new threats appeared relating to using TIM in improvised devices. In general new procedures needed to be elaborated for documents ATP-45(D) and AEP-45(C). Nowadays we have possibility to build serious numerical models for analysing spreading different materials in fluids and to use them for situation analysis.

As I take part in work of NATO CBRN CIS and Warning & Reporting Panel I was involved in elaborating new procedures for the documents above. The first one is related to estimating chemical situation after interception of missile with chemical warhead, the next one gives base for estimating radiation of point source. Third procedure was elaborated not for NATO STANAG but for new Hungarian radiological reconnaissance system including aerial and ground elements. Of course it can be adopted in NATO CBRN estimation system.

For the benefit of my first aim of elaborating missile interception procedure firstly I was need to build mathematical models of detonating warhead, spreading aerosols in different atmospheric layers and forming contamination area on the ground. Having proper method for analysis I had to simplify it and form standard estimation method.

Further investigations were directed to the description of the dose rate from the point source depending on its type and activity. First I selected radioactive isotopes that have significant γ radiation. Next step was to depict linear attenuation of γ rays in the air taking into account quantum energy and buildup factors. Based on this I have elaborated a simple method of calculating dose and dose rate around a radioactive point source.

My third aim was to develop a method for processing rough data from radiological reconnaissance system in the modern GIS environment. This method must have input of

primary data of measurements and output of real radiological situation which can be included in joint command planning system. Performance of the method must be high since there are several thousand or tens of thousand data structure must be converted to dose rate or activity density map in the GIS system.

II. New scientific results

1. The results of my research in analysing consequences of interception of missile with chemical warhead:

1.1. A scenario was established for modelling interception of the short range ballistic missile R-300 SCUD.

1.2. Based on the scenario the circumstances of the interception and atmospheric dispersion were analysed and a mathematical-physical model was built for description of atmospheric spread resulting ground contamination.

1.3. A conservative predicting procedure was elaborated on the base of model above that is easy for use and ready for incorporation in the relating STANAG.

2. The results of my research in analysing description of the dose rate from the point source:

2.1. Mathematical-physical bases of dose rate calculation of different radioactive sources analysed.

2.2. An enhanced procedure was established depicting dose rate function of the point source depending on its type and activity.

2.3. A detailed and simplified procedure was created on the base of enhanced procedure.

3. The results of my research in analysis of the processing rough data from radiological reconnaissance system in the modern GIS environment:

3.1. Mathematical-physical bases of dose rate calculation of different radioactive sources were analysed.

3.2. Different measurements, experiments were completed and the ability of the airborne radiological survey to carry out precise measurements confirmed. This make airborne survey close to ground survey in precision but airborne survey has amazing performance in comparison with ground one

3.3. Kidolgoztam egy új eljárást a légi és földi sugárfelderítés modern technikai eszközei által szolgáltatott nagy mennyiségű felderítési adatainak térinformatikai rendszerben történő értékelésére a valós sugárhelyzet tisztázása céljából. A new procedure was elaborated for processing big amount of rough survey data and evaluation in GIS environment for gathering real radiological situation.

III. As result of my researches:

1. There is possible to survey and monitor big contaminated areas with aerial and ground survey elements having precise and fast processing technology.
2. Incorporating new evaluation procedures in ATP/AEP-45 system enriches capabilities of NBC collecting and control centres.
3. New survey, survey and evaluation methods can be incorporated in the education system of military colleges, academies, used in the training of officers, NCOs and warrant officers.

IV. Publications and lectures related to theme of dissertation

Publications:

1. Zelenák János: NBC scenarios for the SAS Panel Working Group, 2002, NATO restricted.

2. Beatrix Ács, László Csók, József Csurgai, István Goricsán, László Halász, Tamás Lajos, István Pintér, József Solymosi, Árpád Vincze, János Zelenák: Numerical simulation of spreading NBC materials, HADITECHNIKA 1: pp. 13-19 (2005)

3. Ede Baumler, István Pintér, János Zelenák: New equipment of radiation reconnaissance from air platforms, Bolyai Szemle, 2004

4. Ákos, Csécs József Csurgai, Jenő Suda, Gergely Kristóf, István Pintér, János Zelenák: Numerical simulation and model test of NBC materials in buildings, Bolyai Szemle, 2004

5. Ákos Csécs, József Csurgai, Istvan Goricsan, István Pintér, János Zelenák: Numerical simulation and wind tunel experiment of NBC materials in city environment and open field, Bolyai Szemle, 2004

6. Ede Baumler, István Pintér, János Zelenák: Principles and practice in airborne radiological reconnaissance I-II., HADITECHNIKA : (2003/4-2004/1)

7. Ede Baumler, István Pintér, János Zelenák: Principles and practice in airborne radiological reconnaissance, Pro Patria & Scientia Competition, ZMNE, I. prize.

Lectures:

1. János Zelenák, Gábor Nagy, József Csurgai, László Molnár, István Pintér, Ede Baumler, József Solymosi: Use of PIN diode in the airborne radiological reconnaissance, Conference on Flight Science, 24 april 2009, pp 12.

2. János Zelenák, Gábor Nagy, József Csurgai, László Molnár, István Pintér, Ede Baumler, József Solymosi: capabilities of the airborne radiological reconnaissance in the survey of contaminated areas and in searching orphan sources, Conference on Flight Science, 24 april 2009, pp. 14.

3. János Zelenák, István Pintér, József Csurgai, Gábor Gyulai, Ede Bäumler, József Solymosi: Teorethical basics and practical application of the radiological reconnaissance system of HDF, pp. 41.: XXXII. Conference on Radiation Protection, Hajdúszoboszló, 17-19 april 2007, pp. 42.

4. Ede Bäumler, János Zelenák, Gábor Gyulai, István Pintér, József Csurgai, György Svendor, József Solymosi: Development of the joint radiological reconnaissance system of HDF, pp. 42.: XXXII. Conference on Radiation Protection, Hajdúszoboszló, 17-19 april 2007, pp. 43.

5. Ede Bäumler, József Csurgai, Gábor Gyulai, István Pintér, József Solymosi, János Zelenák: Theoretical basics of the radiological reconnaissance system of the HDF and practical realization, XXXII. Conference on Radiation Protection, Hajdúszoboszló, 17-19 april 2007, pp. 42-42.

Budapest, 08.04.2010.

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