DOI azonosító: 10.17625/NKE.2014.032

NATIONAL UNIVERSITY
OF PUBLIC SERVICE
Doctoral Council

NORBERT DARUKA

- Defense and protection against explosive devices and bombings with malicious intents - particularly in regard of performing EOD duties -

Author's introduction and official critics to the PhD dissertation

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Author's introduction and official critics to the PhD dissertation

Supervisors:

Lt.Col dr. Tibor Zoltán Kovács, PhD. of Engineering

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WORDING THE SCIENTIFIC PROBLEM

The changing of the identity and methods of terrorism by the impact of the fight against it shows newer forms and threats. To surprise the enemy - it was always one of the main elements of battlefield combat, causing significant losses by creating unexpected situations or forcing into defenseless position politically and in economic terms, which ensured victory. Nevertheless the opposing forces in most cases tend to follow the rules of the battlefield. This concept has now changed and the modern age warfare has already established a new rule-neglecting and social-value denying forms of combat which do not even spare the civilian population. The terrorists have recognized that the allied armed forces gain unique dominance in traditional operations, which stimulated them to develop the asymmetrical, namely the non-conventional warfare.
The Hungarian Defense Forces started cooperation in 1995 and since that time our soldiers have been present to participate in combat missions. Due to the allied commitments on the battlefield in several countries they take risk day by day often sacrificed their lives during the unequal struggle against the terrorism.
The intelligence and annihilation of the explosive devices are slightly arbitrarily outstanding among the tasks ensuring the freedoms of movement of the armed forces because the explosive devices are one of the greatest hazards for our soldiers on the area of operations.

The skilled members of the terrorist organizations make easily explosive devices for malicious purposes from munitions left behind on war or civil war areas, or from home-made explosives. Regarding the recent incidents of the conflicts – Afghanistan, Iraq, Bosnia and Herzegovina, in which the soldiers of the Hungarian Defense Forces also carried out tasks – outstanding and role and attention were given to the issues of the defence against criminal purpose/terror type explosive devices On the above mentioned areas the security of the Hungarian soldiers' lives were endangered by large amounts of undetonated munitions, extensive minefields, and unusual explosive devices. Our suffered losses also reveal the importance of the area, because so far in respect merely Afghanistan four Hungarian soldiers on duty have lost their lives because of the direct or indirect effects of the explosive devices made by criminal intent.

The creation and the methods of application of the explosive devices are developing rapidly. The physical limitations were eliminated by the possibility of the fast information exchange among the terrorists. The accessibility of the explosive devices is no longer restricted to a certain region and the steps of the craftsmanship of successful attacks almost immediately appear in other areas with the members of terrorist organizations but guided by similar purposes. With the „new" form a warfare - which in many cases reminds us of the guerilla warfare - supply routes and marching routes were blown up as number one targets. In addition to destroy supply routes, today the main objective is to eliminate the soldiers.

For example due to the impact of large losses and the demoralizing effects of the terrorist activities, Spain has already totally withdrawn from the common NATO-operations because of her losses incurred in Iraq. Consequently the safety of friendly and allied forces require the detection and the correct handling of the explosive devices

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endangering our activities. All this necessitates that we should organize and analyze our previous knowledge and experiences in our homeland and on operational areas, and simultaneously discover and elaborate methods, principles which bring new, effective solutions.

I mention as another important factor that the bomb specialist soldiers who perform the expert handling of the explosive devices are especially at great risk, because their expertises - by which they fight against the explosive devices used in mission areas, consequently against the terrorist organizations as well – make them the primary targets. Unfortunately it is reflected in our losses. I consider it vital that all the soldiers, who are perform their duties on mission areas, or will perform tasks on operational areas, be prepared to the threats of the nontraditional warfare, identify the basic characteristics of the devices made by malicious intent, since any of them may be encountered at any time.

In addition to the facts and reasons noted, I have also been inspired in preparing my dissertation that there are no technical regulations, professional instructions in force in connection with this theme. Most of the principles written in the publications dealing with explosive devices are outdated, antiquated, so it is definitely necessary to reinterpret and convert it accordance with the standards of the age.

THE DRAUGHTING OF RESEARCH HYPOTHESES

The studied scientific problems, the aims of my research work, as well as the formulation of the results of my research were motivated, or determined by the research hypotheses below:

- The fast and varied development of explosive devices made for malicious/terrorist purposes, and the diversity of the practical applications of the devices constantly require processing on the latest applications.
- In order to the execution of the accurate and workmanlike training, the elaboration of the documents used today – neither their present form nor their content - does not correspond to the modern requirements. The compliance with the requirements cannot be achieved by the methods used in recent years.
- At the enforcement of the adaptation of the training process, or the the training principles and at the creating of the executive body and the assets of the organization, with the potential highest defence effectiveness we have to take into consideration the modern technical options, the changed conditions and the task system.

RESEARCH GOALS

Due to the fact that the explosion, in the fields of technical sciences, is a complex and diversified speciality, I could not undertake the examination of the entire professional field, only that part that seems to be the most dangerous and bearing the biggest safety risks according to me, that examines the principles and methods of applying the

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explosive devices made for criminal purposes, the possibilities in the defence against them from the perspective of the Hungarian military experts.

I determined as a reseach purpose that I would determine requirements and make suggestions based on scientifically confirmed conclusions:

- for the creating, further developing and applying of the necessary technical devices for supplying the training processes and tasks taking account of the abilities of a Hungarian bomb specialist, and also taking into consideration the anticipated tasks of the EOD units, the available economic and financial support;
- for the enlargement of the possible methods for the activities against the explosive devices made for malicious/terrorist purposes with respect to the effectiveness of the increasing of the preparations.

Further goals of research were also to:

- examine the sources of dangers threatening bomb technician soldiers then to explain to civilian and military specialist why is it necessary to handle the threat of home made improvised explosive devices;
- study, collect and categorize the most frequently used home-made explosive devices used by terrorist organizations and also their methods of utilization, working tools and principles;
- examine the tools, methods, procedures, future development directions of counter activities against explosive devices created with malicious intent then based upon my results to propose suggestions on the target oriented training and preparation tasks;
- examine the possibilities of defence in connection of the operation of specialist teams to prevent the usage of explosive devices to fulfill terrorist goals. To introduce our current protective gear, equipment and defensive capabilities then make suggestions to improve the defensive material and in parallel to that the means to improve safety;
- during my research activities, which are searching for answers to solve concrete situations I would like to reach such solutions which can prevent the bomb technician crew handling improvised explosive devices to receive lasting or permanent injuries during work. I also specify such equipment, tools and procedures which will improve protection, performance of detection and can save lives;
- with my research achievement I facilitate the elaboration of up-to-date explosive device detection and neutralization methods and with that I provide help to create professional handbooks, manuals and guides.

RESEARCH METHODS

During my research work and elaborating the subject I have used both usual and unusual (partial) research methods.

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From the usual methods I also use the historical and the comparative way to improve the protection against improvised explosive devices containing military, industrial and home-made explosives and also to determine the rate of development of explosive devices used with malicious intents.

From the unusual (partial) methods:

- empirical (practical) research method was used during the direct or indirect observation of different protection gear and equipment improving defensive capabilities in regart to their practical application;
- several types of the theoretical-logical research methods were used. I have sorted the sources analytically by actuality then processed them with synthesization. During the process of source materials I also used induction and deduction with the examination of the practical use of improvised explosive devices and with the methods improving the effective use of these devices. With the examination of technologies which provide protection to certain tasks and the study of new devices I also used analysis in addition to the previously mentioned methods.

To achieve my research goal I studied local and international publications and literature and articles about the features of demolition techniques. I have made targeted searches on the world wide web to find unrated documents and publications connected to this topic. I have consulted with local and foreign specialists, with fellow soldiers who gained personal experience with explosive devices in mission areas and with scientific researchers who are involved in this subject and I had compared and refined my own results. I have attended local and international conferences, symposiums where I widened my knowledge on usage the of explosives and explosive materials and about how to prevent dangerous situations.

I participate in the sub-program “blast protection of structures” of “critical infrastructure defense research” project (TÁMOP-4.2.1.B-11/2/KMR-2011-0001, 2012. január 01. – 2013. December 31.) awarded by the National University of Public Service and the University of Obuda. My tasks are to determine the features of bombing attempts, examination of case studies, to study and compare the local and international regulations on protection against explosions, to assist in experimental demolition tasks and analyze the results to make suggestions and recommendations to improve means of protection.

The partial results of my research work was publicized in Hungarian and international military and specialist journals (Honvédségi Szemle, Sereg Szemle, Műszaki Katonai Közlöny, Repüléstudományi Közlemények, Robbantástechnika) I have held lectures to introduce my publications on international, countrywide and local conferences and symposiums.

SIMPLIFIED DESCRIPTION OF RESULTS BY CHAPTERS

By designated research goals I have partitioned my dissertation to four chapters.

In the first chapter I examine the explosive techniques in asymmetric warfare encountered in mission areas. I define the features of explosive devices of malicious intent, I describe their main types, their construction and possible methods of usage. By

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the experiences of international engagements I categorized the employment and installation procedures of improvised explosive devices. At the end of the chapter I make conclusions on the construction and employment properties of explosive devices. I explain my suggestion on the unified explanation of explosive devices of malicious intent, on the definition of IED and I express my reservation about the international wording of definitions.

In the second chapter I describe the NATO's goals of defence against improvised explosive devices, their structure of organizations performing the counter activities and the role of Hungary in the counter activities against explosive devices from international viewpoint. I categorize the defensive methods against improvised explosive devices in regard of protection of forces. I examine the strategic components of the defensive activities then I make conclusions on the tasks of training and preparations of counter-actions against terrorist organizations and their infrastructure.

In the third chapter I describe the basic principles and doctrines of the Hungarian Defence Forces on the handling of improvised explosive devices and on their intentions about the international agreements of standardization. I also explain the training and preparation procedures of personnel who handle explosive devices of malicious intent and I suggest tasks of improvement on the training process. I categorize the technical equipment and protective gear against the effects of explosions which are currently available for the explosive ordnance disposal personnel of the Hungarian Defence Forces. To fulfill future tasks I give suggestions on the possible technical improvements.

In the fourth chapter I summarize the conclusions of my research and all the results of my studies. To conclude my dissertation I make suggestions on the usage of my research achievements and I mark the further path of potential fields of research.

SUMMARIZED CONCLUSIONS

Our soldiers also perform their duties on international battlefields due to allied obligations, therefore the need for a professional technical analysis of the risk factors is unquestionable. The acts of terrorism mean the highest risk factors in respect of the bomb specialists' professional activities, which is also revealed by our losses on the operations area.

In the first chapter of my dissertation, I have systematized the explosive devices made for malicious intents by their most important distinguishing characteristics. I have examined the criterions of application and developing of the devices regarding the bomb specialists' activities. I have featured one of the possible methods of classification of Home Made Improvised Explosive Devices. I have recommended the Hungarian wording of the definition of improvised explosive devices, and in this light I am going to delineate my concerns about the international wordings.

I have concluded that the developement, operation and positioning characteristics of improvised devices may be different even on the same target site. The structural units and professional knowledge needed to develop the devices and depending on the

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possibilities of financial options may change continuously. I consider it a key source of IT danger, because it is accessible from everywhere due to the lack of adequate regulations on sources about IEDs. I have proved that in connection with activities carried out against explosives efforts should not be used to installing devices, but rather to the responsibilities of prevention. I am convinced that it is worth redefining the concepts and findings in connection with the improvised explosive devices both in national and internation context – reformulating it by the acquired experiences.

In the second chapter, I have reviewed the international and national efforts against improvised explosive devices. I have presented the types of standardization agreements related to the research topic and showed their state of national adaptation. Furthermore I have studied the requirements of the legitimized regulations, and their consequences. I have examined the opportunities for protecting forces in connection with the strategic aspects of the counter-activities against improvised explosive devices. I have formulated recommendations for procedures that protect the strategic pillars bearing in mind the safety of employees and helps the training and preparations.

I have found that the system of the NATO's activities against improvised explosive devices culminates in strategic, tactical and operational tasks, which requires the individual's awareness and dedicated implementation of tasks.

Therefore it is absolutely necessary to accelerate the processing of the single training agreements, to continuously plan their pace of introduction both in case of imposing the procedures and acquire the devices. After examining the strategic tasks, I have come to the conclusion that obtaining state-of-the-art training instruments is essential for achieving success in national preparations

In the third chapter, I have examined the training possibilities for deactivating improvised explosive devices. I have formulated recommendations for developing a new trainig system. I have demonstrated and evaluated the technical devices and procedures available for deactivating explosive devices. I have examined the tools and procedures appliable for tasks of bomb specialists for professional handling of explosive devices.

In connection with the preparation course how to deactivate explosive devices, I have concluded that the standards of the training can significantly be improved by more effective training methods, thereby the level of professional expertise of the arson specialists can be increased. For this purpose, I have worked out a training syllabus for deactivating explosive devices taking into account technologies – recommended by myself - that help the training tasks. I have analyzed the technical device system applicable for IEDD tasks - in the arson specialist's point of view who applies the handling procedures of the explosive devices – and some elements of which have been compared with the options ensured by the most modern technical devices. I have conluded that the Hungarian Defense Forces do not have appropriate system to support bomb technician intelligence operations fully for improvised explosive devices, that is why I have formulated criteria requirements with the parametres and developing of the technical devices, and I have suggested the purchasing and the systematic use of technical devices, and also the upgrading those currently available.

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NEW SCIENTIFIC ACHIEVEMENTS

My research work has achieved all my research goals I specified. I have proved with my practical methods that my hypothesis is well confirmed. Summarizing the results of my work I consider the following statements as *new achievements*:

1. I evaluated, analyzed and classified the improvised explosive devices used in asymmetric warfare complying to the new procedures. *I made proposal to reword the definition of IED.*
2. Analyzing the fields of defence against improvised explosive devices I made proposals to remodel the training and educational system of the Hungarian Defence Forces to comply to the international requirements, to modify the curriculum of the IEDD course and I developed the thematic of the new training course.
3. Evaluating the equipment and protective gear used by the Hungarian Defence Forces to handle IEDs, I designated the main directions and needs of modernization; *I made proposals on the acquisition of new equipment and the employment of new procedures which increase the effectiveness, protection and performance of the specialist crew performing their tasks.*

I consider an additional achievement of my research studies that I pointed out the problems with the easy accessibility of electronic and printed manuals on the construction of improvised explosive devices.

PRACTICAL USE OF THE SCIENTIFIC ACHIEVEMENTS

I recommend the results of my "Defense and protection against explosive devices and bombing with malicious intents - particularly in regard of performing EOD duties" research for practical use in the following areas:

- My research job describes the devices of terrorist actions, their operating principles and employment methods. Therefore it can be used as an aid for personnel training in such specialist units.
- It can be used in university grade higher education both for engineering and combined arms officer and NCO training, an aid for teaching related subjects and also it can inspire the students to examine and research this topic further.
- Also useful as provisional training material for preparing combat personnel assigned to mission duties. An important source for creating regulations, combat manuals and directives, and also for teaching support material in military educational institutes. Also useful as background information in the Hungarian Defence Force school program for general information and improved knowledge base.

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RECOMMENDATIONS

For the improvement of safety factors and the successful execution of target oriented training and education regarding the protection against improvised explosive devices on general and specific fields of action, I recommend:

- The acquisition and integration of the simulators and their software support I mentioned in my dissertation into the training activities.
- The acquisition of practice and training variants of the main IED types to create the most realistic situations for the best possible means of theoretic and practical training in our country.
- The purchase and employment of state-of-the-art specific EOD supportive technical equipment and tools for the specialists by taking the specific nature of defensive task against explosive devices into account.
- Following international examples the creation of our own local, up-to-date IED databank to help the activities and specialist training against improvised explosive devices. Providing secure access rights to members of cooperating organizations.

The terrorist activities and the protection against are too complex and broad topic for a complete presentation. My scientific studies are available as a source for further studies of this field. I consider these additional fields especially important:

- I consider the technology and detection methods of explosive materials a research field of great importance.
- It is strongly recommended to carefully study the means of defense in existing and future military bases and camps. Important to consider the destruction capabilities of IEDs to plan defensive structures when constructing new bases.
- Similarly important field of research can be to examine the possibilities how to limit the public access and supply of required components, ingredients, electronic and printed manuals to create improvised explosives and to construct various IEDs.
- It would be also useful to examine the methods of creation and composition of home-made explosive materials and devices and their usage regarding the experience of other cooperating organizations encountering this problem.

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PUBLICATIONS LIST OF THE CANDIDATE IN THIS TOPIC

Lectored publications in scientific journals

Journals in foreign language

1. **Hejmfaritaj eksplodiloj** (Home-made explosive devices); Teleskopo Internacilingva Scienca Revuo, 2013. Kvina eldonoj, pp. 1–11. ISSN 1984–7874. – In. http://www.teleskopo.com/daruka.pdf

Hungarian journals in foreign language

2. **Bombers, wires and explosives part I. – Death within a reach –;** Műszaki Katonai Közlöny XXIII. évfolyam, 2. szám, 2013. november, pp. 73–80. ISSN 2063-4986.
3. **Bombers, wires and explosives part II. – Death arrives with us –;** Műszaki Katonai Közlöny XXIII. évfolyam, 2. szám, 2013. november, pp. 64–72. ISSN 2063–4986.

Hungarian scientific journals

4. **Robbanóanyag-kereső kutyák a Magyar Honvédségben és a missziós területeken**; (Explosive search dog in HDF and on mission areas) Honvédségi Szemle 2010. évi 64. évf. 2. szám, pp. 15–19. ISSN 2060–1506.
5. **A bűnös célú/terrorista robbantások és az ellenük való védekezés lehetőségei**; (Defense and protection against explosive devices and bombing with malicious intents) Műszaki Katonai Közlöny 2010. évi 1–4 összevont kiadás, pp. 229-242. ISSN 1219–4166.
6. **Robotok alkalmazhatósága a tűzszerész feladatok tekintetében**; (Usage of robots in EOD operations) Sereg Szemle X. évfolyam, 2. szám, 2012. április-június, pp. 43–54. HU ISSN 2060–3924.
7. **Tűzszerészek a közszolgálati feladatok ellátásában**;[1] (Explosive Ordnance Disposal units in public service) Sereg Szemle X. évfolyam, 2. szám, 2012. április-június, pp. 22-34. HU ISSN 2060–3924.
8. **A robbanóanyag kereső kutyák alkalmazhatósága repülőterek átvizsgálása során**; (Usage of explosive searching dogs in airport security searches) Repüléstudományi Közlemények On-line folyóirat 2009/2. szám, HU ISSN 1789–770X. – In. http://www.szrfk.hu/rtk/kulonszamok/2009_cikkek/Daruka_Norbert.pdf
9. **Robotok a repülőtéri biztonságért;** (Robots for airport security) Repüléstudományi Közlemények On-line folyóirat 2011/2. szám, HU ISSN 1789–770X. – In. http://www.szrfk.hu/rtk/kulonszamok/2011_cikkek/Daruka_Norbert.pdf

[1] Co-author: 1st Lt. Vörös Mihály, MH 1. Honvéd EOD and Warship Regt, Operative units, Special EOD Coy, XO

10. **Terroristák és taktikák, avagy védekezz, ha tudsz**; (Terrorists and Tactics – Defend if you can) Repüléstudományi Közlemények On-line folyóirat XXIV. évfolyam 2012/2. szám, HU ISSN 1789–770X. – In. http://www.szrfk.hu/rtk/kulonszamok/2012_cikkek/02_Daruka_Norbert.pdf
11. **Kvadrokopter, mint lehetséges felderítő eszköz, avagy a repülő polip visszatért**; (The quadrocopter in reconnaissance duties – the return of the flying octopus) Repüléstudományi Közlemények On-line folyóirat XXV. évfolyam 2013/2. szám. HU ISSN 1789–770X. – In. http://www.szrfk.hu/rtk/kulonszamok/2013_cikkek/Daruka_Norbert.pdf

International professional's conference presentations publicized

Lectored presentation in foreign language

12. **IEDD – Improvised Explosive Device Disposal**[2] (Improvizált robbanószerkezetek szakszerű kezelése)' International Conference on Military Technologies – ICMT 2013, Brno 2013. május 22–24., pp. 383–390. ISBN 978–80–7231–917–6.
13. **Špeciálne trhacie práce pyrotechnikov pri každodennej činnosti a na misiách** (Special demolition operations of EOD teams in everyday work and in mission areas); Trhacia Technika 2010, Slovak Republik, Kongresové centrum ACADEMIA Stará Lesná 20–21. mája 2010. pp. 238–245. ISBN 978–80–970265–2–3.
14. **Technické aspekty výbuchov pri asymetrickej bojovej činnosti** (Views on explosive techniques in asymmetric warfare); Trhacia Technika 2011, Slovak Republik, Kongresové centrum ACADEMIA Stará Lesná 26–27. mája 2011. pp. 201–208. ISBN 978–80–970265–3–0.
15. **Možnosti kategorizácie improvizovanývh výbušných prostriedkov** (Classifications of the improvised explosive devices); Trhacia Technika 2012, Slovak Republik, Kongresové centrum ACADEMIA Stará Lesná 23–25. mája 2012. pp. 168–178. ISBN 978–80–970265–4–7.

Hungarian professional's conference presentations publicized

Presentations on Hungarian language

16. **Az EOD–9 védőfelszerelés alkalmazhatósága a hazai és a nemzetközi tűzszerész feladatok ellátása során**; (Usage of the EOD-9 protective suit in local and international EOD duties) New Challenges in the Field of Military Sciences Budapest, 2009. november 18–19., p. 13. CD-ROM ISBN 978–963–87706–4–6.
17. **A robbanóeszközök megsemmisítésének lehetőségei a tűzszerész feladatok tekintetében**; (Disposal of explosive devices – possibilities in EOD work) VIth International Symposium on Defence Technology 6–7. May 2010. Budapest, CD–ROM ISSN 1416–1443.

[2] Co-author: dr. Kovács Zoltán Tibor, Nemzeti Közszolgálati Egyetem, egyetemi docens.

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18. **Az „IED", mint a terrorizmus leghatékonyabb eszköze**; (The IED as the most effective instrument of terror) „Fúrás- robbantástechnika 2010", 10. Nemzetközi Konferencia Balatonkenese 2010. szeptember 8–10., pp. 162–169. HU ISSN 1788–5671.
19. **A házilag készített robbanószerkezetek avagy szinesdrótok és robbanóanyag, mint a terrorizmus leghatékonyabb fegyverzete**; (Home made explosive devices – colourful wires and explosive as the most effective weapon of terrorism) New Challenges in the Field of Military Sciences Budapest, 2010. szeptember 28–30., CD–ROM ISBN 978–963–87706–6–0.
20. **Bűnös célú robbanószerkezetek alkalmazásának és hatástalanításának sajátosságai**; (Explosive devices of malicious intent and the means of their defusal) „Fúrás- robbantástechnika 2012", 11. Nemzetközi Konferencia Balatonkenese 2012. szeptember 19–21., pp. 109–118. HU ISSN 1788–5671

SCIENTIFIC-PROFESSIONAL BIOGRAPHY OF THE CANDIDATE

Professional experience:

2005-2007 MH 1. Honvéd EOD and Warship Regiment
Position: Operative units, Warship Company, Minesweeper No.3,
Platoon Commander

2007-2010 MH 1. Honvéd EOD and Warship Battalion
Position: Operative units, Warship Company, Minesweeper No.2,
Ship Commander

2010-2011 MH 1. Honvéd EOD and Warship Regiment
Position: Operative units, Warship Company, Minesweeper No.2,
Ship Commander

2011- MH 1. Honvéd EOD and Warship Regiment
Position: Operative units, Warship Company, Minesweeper No.1,
Ship Commander

Educational institutes:

1989-1997 Taktaszadai Általános Iskola (elementary)
1997-2001 Magyar Honvédség Lenkey János Honvéd Középiskola és Kollégium
2001-2005 Zrínyi Miklós Nemzetvédelmi Egyetem, Bolyai János Katonai Műszaki Főiskolai
Kar, Műszaki Építőmérnöki Szak (Bsc.)
Degree: *Construction Engineer (military)*
2007-2009 Zrínyi Miklós Nemzetvédelmi Egyetem, Bolyai János Katonai Műszaki Kar, Vegyi és Katasztrófavédelmi Intézet, Védelmi Igazgatási Szak, Katasztrófavédelmi Szakirány (Msc.)
Degree: *Certified defence administration leader*

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2009-2013 Zrínyi Miklós Nemzetvédelmi Egyetem, Katonai Műszaki Doktori Iskola, Katonai Műszaki Infrastruktúra Elmélete Tudományszak (PhD.)
Subject of dissertation:
Defense and protection against explosive devices and bombing with malicious intents - particularly in regard of performing EOD duties.

Trainings, courses:

2003 German Language course Mittenwald
2005 Small motor boat sailing license (sport & recreational)
2005 CSM-40 boat engine operator
2005 TOHATSU boat engine operator
2008 Unified Digital Radio System operator
2010 Large motor boat sailing license (professional)
2012 Master demolitions expert

Languages:

German medium level type A state language exam with military specialization
German medium level type B state language exam with military specialization
Esperanto medium level type C state language exam

Membership in scientific organizations:

From 2009, Magyar Hadtudományi Társaság, Műszaki Szakosztály. (Hungarian Association of Military Science, engineering section)
From 2009, Magyar Robbantástechnikai Egyesület (Demolitions Technical Society).

Budapest, 2013. november 21.

Norbert Daruka