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**APPLICABILITY OF UNMANNED AIRCRAFT SYSTEMS FOR AIR
RECONNAISSANCE IN OPERATIONS OF AIR FORCE FLYING
UNITS**

Author's synopsis and official report on the Ph.D. thesis

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FORMULATION OF THE SCIENTIFIC PROBLEM

I have been following up the development and application for new practical tasks of the *Unmanned Aircraft Systems* (hereinafter UAS) since the 1990s. These systems seemed mysterious and had a deep impact on me. The mystery slowly disappeared and these systems are widely present now in the inventory of the modern warfare – from strategic level to single soldier. Mainly, they are applied for getting information, air reconnaissance and monitoring. However, it is easy to see that technological innovation make UAS to be able to meet new challenges in the near future. During the last few decades, need for application of UAS which is the consequence of the followings:

- The essence of armed battle has been significantly changed. In among others, effect-based operations (EBO) on non-linear battlefields and rapid process of events are the reasons of this. Real-time intelligence is increasingly important in new situations, at decision making and application level as well. According to the concept of EBO and different political, social, economic, legal and humanitarian factors, precision weapons are increasingly wide range applied. The most accurate intelligence and target information are essential for the efficient application of these weapons as well. Today *Unmanned Aerial Vehicles* (hereinafter UAV) are able to meet the need for air intelligence, firstly on the base of their comprehensive application and network warfare capability.
- Protecting human life has been revaluated in modern warfare. Increasing protection of soldiers on mission is getting more stressed in the field of political and military planning. Contrary, according to the application of modern weapon systems, reconnaissance and destruction probability of air defence have been increased. Risk for losing aircraft and their crew in battle has been higher. Mainly due to the smaller radar cross section, it is more difficult to observe UAVs by the air defence system than aircraft with crew. Therefore, air defence activity against UAVs is less efficient.

Among others, these are the reasons why military leaders are looking for such military technology that can be applied efficiently in missions endangering human life. Relatively low cost of production, maintenance and operation has promoted their wide-range spreading.

Consequently, UAVs are applied in many countries. Development and bringing into service are going on in the near future as well.

Air reconnaissance and monitoring is the main task of the flying units of the Air Force, even if the results are essential mainly for the objectives of the other services. Both Joint Doctrine and Air Force Doctrine determine air reconnaissance as the task of the flying units in Hungarian Defence Forces. UAVs can be found among these, though they are not in service, for that task should be fulfilled by other flying assets. Realizing the organization of the Air Force, its main activity, the forces and assets in service, I am not convinced about the reality of fulfilling air reconnaissance tasks.

Therefore, several questions have been arisen. How Air Force is able to fulfill air reconnaissance and monitoring tasks with their actual flying assets? Why do not use such asset-system for fulfilling these quite dangerous tasks, which is less expensive and safer? What are the capabilities, which make UAS to be in service in many countries? What are the tasks they can be used for?

This dissertation is about to find answers for opportunities of application of UAS in air reconnaissance.

RESEARCH OBJECTIVES

In this paper, I have set the following objectives of research:

1. Introduction and analysis of UAS sub-systems and relations, and revelation of determinant qualitative capabilities of the system.
2. Introduction of UAV roles in local battles, and effect on battles considering changes in principles of application, technological development and efficiency of UAVs.
3. Relations between the tasks which can be fulfilled by the UAS and operational forms of Joint Air Operations
4. Detailed analysis of tasks of UAS, special regard to air reconnaissance and monitoring
5. Comparison between requirements on flying assets fulfilling air reconnaissance and actual air reconnaissance capability.

RESEARCH METHODS

In order to achieve the research objectives mentioned above, I have applied the following research methods:

- I have studied the literature relevant to the topic of my thesis, I have carried out expedient research in libraries, at air force units and on the internet;

- I have organised the obtained knowledge;
- I have taken part in nationwide and international conferences, held lectures there, published articles and gained experience;
- I have written essays on research results;
- I have consulted experts in aviation who are experienced in the field;

During researching and working out of the topic I applied general (observation, analysis, synthesis) and specific (observation, analysis) research methods.

SUMMARY OF THE TESTS CONDUCTED

Regarding structure, the dissertation consists of Introduction, 4 Chapters and Summary of research results.

In **Introduction** I describe the factors motivated me to write this dissertation. I write about the actuality of the topic, the research objectives and research methods.

In **Chapter 1** I make the difference between UAV and UAS clear, giving the definitions of them. I introduce the sub-systems, the elements and main tasks of the sub-systems. I create a new classification system.

In **Chapter 2** I introduce the preliminaries of evolution of UAS, analyzing its role in local battles, and present the changes in principles of its application, technical development and efficiency.

In **Chapter 3** I make known the reasons for changes in warfare and armed conflict, the answers of NATO on them, the subject of Joint Air and Space Operations Doctrine, the role and main tasks of UAS on this doctrine.

In **Chapter 4** I am writing about the need for air reconnaissance, the requirements on flying assets fulfilling air reconnaissance, and making the analysis of the actual air reconnaissance capability of the Hungarian Air Force.

In **Summary of Research Results** I sum up the research work and determine new thesis.

SUMMARY OF CONCLUSIONS

Research and Development has created such equipment and asset-systems on the field of military technology, which had been only fantasy before.

Due to the appearance and integration into the services of the UAS, participants of decision preparation, decision making and execution gained a new capability. The benefit of using UAS is justified in peacetime, conflict and war. However, the main benefit is to be

a deputy of human force in the most dangerous missions. During the development UAS has reached the point where they can directly help strategic decisions.

On the base of the analysis I state that the Hungarian Armed Forces are at a disadvantage regarding air reconnaissance capability, having limited capacity and opportunity.

It is regrettable but must be accepted. However, the fact that information gained from only visual air reconnaissance is not enough for the success in a modern warfare should be clear. Anyway, this situation must be changed with the help of deliberate plans, and integration of the required material and mental resources.

Application of JAS-39 for air reconnaissance is possible only at the price of its other capabilities (air-to-air, air-to-ground). If it is necessary to maintain basic capabilities, other asset should be brought in service for air reconnaissance.

For this purpose I consider the application of UAS as an acceptable solution according to the facts detailed in this dissertation.

NEW SCIENTIFIC RESULTS

New results of my dissertation are to be summarized in the following thesis:

1. I CLASSIFIED the unmanned aerial vehicles, I DETERMINED the sub-systems, I analyzed the system – sub-system- environment relations (system-view approach, system analysis)
2. I made a NEW CLASSIFICATION, focusing on operational planning and application, of the UAS, on the base of their specific application modes and the characteristics of useful load, and put into words the determinant qualitative capabilities.
3. According to the principle of retrospectivity I ANALYZED AND REVEALED the role and impact of UAS in local battles, considering changes in principles of its application, technical development and efficiency.
4. I ANALYZED the possible roles played by UAS in (joint) air operations, and the possible tasks of the systems.
5. I ANALYZED IN DETAIL the tasks of the UAS with special regard to air reconnaissance and monitoring operations. I DETERMINED the requirements on flying assets fulfilling air reconnaissance and analyzed the actual air reconnaissance capability.

PRACTICAL APPLICABILITY OF THE RESEARCH FINDINGS, RECOMMENDATIONS

Writing this dissertation does not mean the end of my researches. I consider the UAS as having future. I hope that UAS is to be brought in service soon in the Hungarian Armed Forces and they will be able to increase the efficiency of the air reconnaissance and, therefore, the efficiency of joint reconnaissance.

In my further research I would like to deal with working out the procedures of application of UAS in national airspace.

The complete dissertation and its chapters separately CAN BE USED in military higher education, in university basic education, and in the theoretical training and further education of the staff working in the field of joint application.

It can CONTRIBUTE to the further development concerning UAS, to proposals and to making reports. It can PROMOTE scientific research.

LIST OF PUBLICATIONS AND OTHER SCIENTIFIC PUBLIC ACTIVITIES RELATED TO THE DISSERTATION

1. **Palik, M.** Executable tasks by UAVs in NATO Tactical Air Force application, Aviation Science Publications, Szolnok, 1999/1, p.307–320
2. **Dr. Krajncz, Z. – Palik, M.** Doctrinal interpretation of air-to-ground operations in NATO, Aviation Science Publications, Szolnok, 2000, p.61–69
3. **Palik, M.** Possibilities of civil application of UAVs, Aviation Science Publications, Szolnok, 2000, p.221–230
4. **Palik, M.** Specific characteristics of application of UAVs in national airspace, Aviation Science Publications, 2001, Szolnok, p.205–212
5. **Palik, M.** Useful load of UAVs, Aviation Science Publications, Szolnok, 2002, p.81–86
6. **Palik, M.** „Need for Unmanned Aerial Vehicle System”, Military Engineer (under being published)
7. **Dr. Czövek, L. – Palik, M.** Extended-range Plan of HDF Air Force Command 2003-2005: Development of UAVs: experiences on application of UAVs to date and analysis of applicability in national, HUAF, 2002
8. **Palik, M.** Extended-range Plan of HDF Air Force Command, 2003-2005: Realizing HDF air reconnaissance capability, HUAF, 2003
9. **Kis, K. – Palik, M.** Extended-range Plan of HDF Air Force Command, 2003-2005: Harmonization of capability-based Air Force and the national and allied tasks of capability development, Possibilities of individual capability development, as main factor determining basic capability of Air Force, HUAF, 2004

PROFESSIONAL ACADEMIC BACKGROUND

My name is Palik Mátyás, I was born in Békéscsaba, 1963. I lived in Békés in 1977-1981, I studied in Szegedi Kis István Industrial Secondary Technical School, Békés.

In 1981, I was accepted to Killián György Military Aviation Technical College, Szolnok.

I was commissioned officer in 1985, after graduation as certified fighter aircraft controller officer and primary school Russian language teacher.

I got my first officer position at the College, at the Aircraft Pilot and Intercept Controller Department, as instructor. I taught fighter aircraft controller cadets basic subjects concerning the profession. I obtained the experience for practical training at 59th Tactical Fighter Wing in Kecskemét. After that I could participate in practical education as well.

I participated a 10-months intensive language course in 1992, Szolnok.

I was accepted to Zrínyi Miklós Military Academy staff officer training. I graduated with excellent result in 1994.

I continued my studies at the Air Force and Air Defence Faculty of Zrínyi Miklós Military Academy from 1994, and I finished with first-class certification in 1996.

During my studies at the Academy I studied German, and passed a language exam in 1996. In the same year, I obtained international Radio-telephony operator license.

After graduating from the Academy, I went back to Air Traffic Controller Department as assistant. My job was the theoretical and practical preparation of air traffic controller cadets and air traffic controller officers participating in trainings.

On 1st of August, 1996 I was commissioned as assistant of the Szolnok Air Force Officers' College, Air Traffic Controller Department.

In 1998 I obtained the senior lecturer title of the Aviation department of the Military Science of Miklós Zrínyi National Defence University.

In 1998 I was accepted to Doctoral Committee of Zrínyi Miklós National Defence University. In the first semester of these studies I was private student, because I participated in a 5-months English language course in Canada.

In 2000, I participated in an ECDL basic computer operator course. At the end of the course I passed my exams and received the European Computer Driving Licence.

Since 1st of September 2003, I have been carrying out the duties of deputy head of the Air Force Operation department of the Kossuth Lajos Faculty of Military Science of Zrínyi Miklós National Defence University.

I have been appointed deputy head of department since 6th of January, 2005. According to the scope of my duties I have been continuously participating in working out of basic

documents of different higher education basic trainings (3-years, interim, 4-years college, BsC) and ten different special trainings. The scope of my tasks covered 50% theoretical and 50% practical subjects concerning the profession, depending on the characteristic of the subjects. I have been continuously participated in development of the Department's educational basis and simulator equipment.

During my more than 20-years tutorial career I have been present in training of fighter aircraft and air traffic controller cadets, and further training of pilots and air traffic controllers. I consider the planning and carrying out of the preparation of national and foreign NATO military air traffic controllers for NATO ISAF Kabul mission as a special success.

I have been consultant of many cadets on Students' Scientific Conferences. I am proud of that one of my students was rewarded with Pro Scientia Medal by the Council of National Scientific Students' Associations in 2003.

I have got advanced level Russian language certification with special terminology (both oral and written), intermediate level German language certification (both oral and written) and advanced level English language certification (oral).

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I would like to say thank you for all who helped to complete my scientific work and achieve the objectives set out by critics, counsels and opinions.

Special thanks to my Consultant, Ret. Lieutenant General, Dr. József Szabó, who helped me with his high patience and outstanding competence.

Szolnok, 19th March 2007

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