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INTRODUCTION OF THE HUNGARIAN UNMANNED AERIAL VEHICLE OPERATOR'S TRAINING COURSE

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Abstract:
In today's modern army we are facing several unmanned aerial vehicles for various purpose. The Hungarian Defence Forces has gone two different types of UAV[1]s into service since 2010. Due to this reason it is essential to have well trained operators to run the UAS[2] in proper ways. The operator's training is realized in frame of a military training course. In the article the authors introduce the current training courses, summarize the experience has gained during the training and make suggestions for further studies. The last part of the paper includes a brief insight into an ongoing R & D[3] project related sub-area in Hungary.

Keywords: UAV, training course, New Széchenyi Plan, UAS, evaluation,

1. Introduction

In this paper the authors will introduce the various UAV operator training courses held in Hungary in the last years. It is important to clear the definition of UAV: ""Once- or multi-useable, wireless controlled, powered aircraft, using aerodynamic forces to fly. Flying remotely controlled, autonomous or using combined management controls function, with the capability to carry lethal or non-lethal cargo."[1] The goal of the courses was different but also a bit similar to each other. The main idea was to share the experience gained during the course planning and the answers for the different difficulties of the practical evaluation and course subjects.

2. Meteor 3-MA operator training course

At the beginning of 2010 it was clear the HDF will pull-out the L-39 Albatross light training and close support aircraft from the active service due economical reason. With the withdrawal the airplanes some of its main task still existed and it would not be cost-efficient to fulfil this missions with a fighter aircraft. To solve the problem the HDF let invent a UAV called Meteor 3-MA.

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1 UAV: Unmanned Aerial Vehicle
2 UAS: Unmanned Aerial System
3 R & D:Research and development

2.1. Meteor 3MA

The UAVs main task is to provide sacrificial, disposable but reliable targets for military exercises, training and live firing of MISTRAL self-guided surface to air missile system and its associated services without endangering human life, buildings and equipment with high reliability in a harsh military environment. The aerial target is suitable to train, and exercises the GBAD[4] operators in special conditions [2]. It has the capability to simulate the flight path and the movement of a low flying, slow aircraft.

Fig.1 METEOR 3MA target UAV

2.2. Specification of the Meteor-3 target drone

–*Purpose:* artificial air target, carrying special payloads in modular nose cone
–*Application:* simulation of target for air defense weapon systems training or on the battlefield to reveal enemy's radar position
–*Action radius:* 10 km
–*Endurance:* 20 minutes
–*Payload:* up to 3 kg
–*Max altitude:* 2–3 km
–*Flying velocity:* 130–140 km/h
–*Wing span:* 2.7 m
–*Length:* 1.8 m
–*Empty weight:* 11 kg
–*Propellant:* internal combustion engine, volume 30 cubic cm
–*Fuel:* methanol, castor oil and secret additives
–*Control:* PCM RC[5], optional video and GPS[6]
–*Take off: catapult with winch*
–*Landing: special reinforced skid*

4 GBAD: Ground Based Air Defence
5 PCM RC: Pulse Code Modulation Radio Control
6 GPS: Global Positioning Sytem

– *Wind speed limit: 40 km/h*
– *Weather condition: all Hungarian weather conditions, except heavy rain, snow or fog*

2.3. Training program for Meteor 3 MA operators

The purpose of the training program was to give over general and specific knowledge to the operators and sufficient practical proficiency which assures the safe operation both on the ground and in the air. The program has been intended according to the 16/1998 DM-HM common decree about aircrews licensing and according to the 5/2003 DM decree about the specialized training of state aviation staff.

2.4. Determination of the curriculum

Based on the operational work on the drone, there are three different working posts: operator I.-UAV (drone) operator, Operator II.-Route planner, Operator III – technical support person. To secure the main goal of the training course we had to select the most important subjects for the different operator positions. There is a basic knowledge section which is compulsory for all the participants. It includes general information about the principles of flight, meteorology and rules of the air.

Subject Group	**Subject**	**Number of lessons**	
		Theory	Practice
I. Basics	Aerodynamics	6	
	Aircraft frame and systems	4	
	Engine knowledge	6	
	Control Engineering (automatics)	6	
	Air Traffic Services and procedures	6	
	Orientation in the air, Air Navigation	3	3
	Flight procedures	6	
	Aviation meteorology	5	1
	Aviation medical knowledge	4	
	Aviation law	4	
	Radio- telephony operator basic knowledge	3	3
Altogether:		**53**	**7**

Table 1.

The next subject group is meant for Operator I., so called UAV pilot. He is responsible for the safe ground and air operation; he is the one, who controls the special features of the drone. The subject group contains the rules of documentation, flight safety issues and the special on board equipment in 30 lessons.

Subject Group	**Subject**	**Number of lessons**	
		Theory	Practice

II. Device knowledge (Operator I.- UAV pilot)	Aircraft structure & Engine	6	2
	Rules of documentation	2	
	Control system	3	1
	Special on-board systems	3	1
	Flight safety	5	
	Air and ground operation	5	3
Altogether		**24**	**6**

Table 2.

The next kind of operator is the route planner. His responsibility is to set up the flight route according to the requested profile of the GBAD training. He has to be familiar with programming, but also with flight safety to ensure the safe operation.

Subject Group	**Subject**	**Number of lessons**	
		Theory	**Practice**
II. Device knowledge (Operator II. – Route planner)	Route planning &Programming	16	2
	Rules of documentation	2	
	Flight safety	5	
	Special settings	4	1
Altogether:		**27**	**3**

Table 3.

The third member of the crew is the technician. He repairs the drone if it is needed during the mission and he carries out the pre- and after flight checks.

Subject Group	**Subject**	**Number of lessons**	
		Theory	**Practice**
II. Device knowledge (Operator III. - Technician)	Repairing and refurbishing	4	4
	Quality controlling	4	2
	Flight Safety	2	
	Rules of documentation	5	
	Safe ground operation	4	5
Altogether:		**18**	**12**

Table 4.

After the classroom education there are 12 lessons in the field. The different operators have to be work together as a crew using the theory what they did learnt during the classroom training. After the successful theoretical examination the separate operators has to perform a real en route flight to prove their proficiency.

Subject Group	Subject	Number of lessons	
		Theory	**Theory**
III. Practice (examination)	Practice and test flight examinations		16
	Theoretical examination (test)	4	
Altogether:		**4**	**16**
Overall:		**124**	**46**

Table 5.

2.5. Examination and evaluation

The exam is a combined theoretical and practical exam; the received grade is the average of the above mentioned exams.

Parts of the examination:

–*Written exam (test);*
–*Practical, operational exam.*

2.5.1. Written examination

Subjects of the written exam (test):

–*I. Subjects of the Basics;*
–*II. Device knowledge (according to the special operator post).*

Timeframe of the written exam: maximum 4 X 45 minutes.

On the written examination the participants have to fill out a combined test, which questions include the material of the lessons and the suggested bibliography.

The question sheet contains answer making, answer completion and multiple choice tasks which ensures the objective knowledge measurement of the participants.

The examination sheet has to contain only the training program related subjects, and it is not allowed to question any other additional subjects.

Evaluation of the written exam:

The written worksheets should be evaluated according to the repair guide. The five-point scale assessment should be based on the following percentages:

–*Insufficient (1)* — *0 – 50%*
–*Sufficient (2)* — *51 – 65%*
–*Satisfactory (3)* — *66 – 75%*
–*Good (4)* — *76 – 85%*
–*Excellent* — *86 – 100%*

2.5.2. Purpose of the practical exam:

To make sure that the course participants are able to apply the theoretical knowledge on a good level this ensures the flight mission preparation, and the safe air and ground operation at the specified operational positions.

The courses requirement of compliance will be considered successful if the test at least adequate (MF). If any of the tests (oral and written) results as failure (fail) the examination results is insufficient.

Content of the practical examination

Operator I. - Pilot: His task is to perform a check flight (proper execution of a traffic circuit), to find solution to an emergency situation: (engine failure during take-off, landing in back wind, landing without airbrake).

Operator II. – Route planner: Planning, programming an autopilot control route in a given map segment including simulation and on-time online flight path change via telemetry.

Operator III. - Technician: His task is to assembly the UAV from its kit-box and dismounting to the box.

2.5.3. Overall Assessment:

The final evaluation is the average of the received practical and written exam grades.

The courses requirement of compliance will be considered successful if the examination at least sufficient (MF). If any of the exams (theory and practical) results as failure (fail) the final examination results is insufficient.

Exemption from the exam should be not given.

To document the examination process there is a need of a registry sheet and upon successful completion, a certificate shall be issued. The successful completion of the training is documented with a certificate, signed by the heads of participating organizations.

2.5.4. Determination of the training terms

Personnel relations of the training course

Instructors are professionals with relevant academic degree and professionals with relevant skills and experience.

Trainees are personnel planned to be operator on the METEROR-3MA unmanned aerial vehicle.

The basic requirement is for the trainees to have at least high school graduation degree. Location of the training course was the campus of ZMNE Bolyai János Military Engineer Faculty, Aviation and Air Defense Department, and the civilian airfield of Bőny.

General and professional supervision of the training course

The program of the training course has been approved by the National Transport Authority's Aviation Directorate in a decree. [3]

2.6. Firsthand experience

To tell the truth it was the first UAV operator course in the history of our department. We had to select the subject groups and the single subject and lesson numbers to fulfil the requirements of the staff qualification however this special kind of operation does not requires any staff licensing. To start this work we had to find similarities to the special operator post in the manned aviation.

The main problem was the following: there were not any corresponding legal regulations to this issue. The main idea was to establish a specific frame of subjects to ensure safe operation of the UAV operators at least in closed airspaces according to the present legal regulation. The training course seems to be successful because there was not any accident and crash of this kind of UAV up to this day.

3. Skylark 1-LE operator course

It is common sense that in 2008 the Hungarian Defence Forces had obtained some Skylark 1-LE unmanned aerial vehicle manufactured by the Israeli Elbit Systems. The new system provides new capability of air reconnaissance for the troops serving in Afghanistan. There is essential to have well trained operators who run the system in proper way, and are able to carry out the reconnaissance and observation missions. The operators' training is realized in frame of a military training course.

Upon experiences of the first UAV operator training course the National University of Public Service got the task to organise a training course for the operators of the new small UAV system named Skylark 1-LE.

3.1. Skylark 1-LE

Fig.2 Skylark 1 LE SUAV

It is a highly covert UAS enabling intelligence surveillance and reconnaissance (ISR) missions, delivering actionable, high resolution video in real time to its easy to use mini ground control system and to forwardly deployed forces via remote video terminals (RVTs).

The system is man-portable and can be deployed by dismounted teams or in vehicle based mobilization / deployment configurations including on-the-move operation. Skylark® I LE is a highly autonomous system, including a fly-by-camera mode enabling

day or night detection and tracking of fixed or moving targets and intuitive mission execution with minimal training.

Skylark® I LE is ideal for lower echelons organic beyond-the next-hill reconnaissance, artillery forward observer functions force protection tasks, as well as various HLS[7] and commercial application missions. [4]

Performance:

–Take-off weight 7.5 kg
–Max Payload 1.1 kg
–Endurance 3 hours
–Service Ceiling 15,000 ft
–Range 20-40 km
–Speed range: 60-120 km/h

As I mentioned the department had already practice setting up training course for UAV operators, however the new task seemed to be more complex. In this case the UAV operation will be executed in operational area and the operation is strict bound to a military task like reconnaissance and online observation of non-friendly troop movements. Before 2010 the Hungarian Defence Forces weaponry did not have contained such kind of technical vehicle, so the training of the operators appears as a new task at the Operational and Training Department of the Defence Ministry of Hungary.

3.2. Requirements of the Skylark 1-LE training courses

During deployment of new weaponry it is extremely important task is to train the operative personnel on high level for a future mission's execution. To ensure the full mission capability and the standardized training of operators, the Operational and Training Department of the Defence Ministry of Hungary determined strict requirement system for the SUAV operator training.

This document is to regulate the main goal of training, the syllabus and the units taking part in the training.

The training is a basic training in a frame of a military training course for annually 10 soldiers. The participants who completed the course have to be able to use the theoretical knowledge in practice to ensure preparation for flight of the device and have to be able to execute a safe ground and air operation to carry out special military tasks.

3.3. Professional requirements

It was a big challenge for the participant to beat the course because the totally divergent subject from their basic knowledge. The personnel had to master the UAV system and the terms and abbreviations used in NATO. It was compulsory to learn the basics of the flight, the aerodynamic of fixed winged aircrafts. According to the area of application, the participants had to learn the basics of meteorology, mainly the low level meteorological formation and its influence on mission fulfilment.

It was the basic idea to use the UAV in international missions so the operators had to learn the usage of domestic and NATO maps, had to be able to convert units according to the safe flight planning. To minimize the danger for other flying vehicles in the vicinity

7 HLS: Homeland Security

of the mission it was necessary to mention some issues of flight safety. Of course the device knowledge was compulsory for all the participants.

The responsible organization to work out the training program was the former Zrínyi Miklós National Defence University, Bolyai János Military Technical Faculty, Aviation and Air defence Institute, Air Traffic Controller and Pilot(Aircrew) Department.

This organization got the task to work out the training course, the subjects groups and the number of the lessons and the method of the final evaluation.

The training document has been approved by department leader of Operational and Training Department of the Defence Ministry of Hungary.

The course contains 420 contact lessons based on four main subject groups.

I. Subject Group Basics	**II. Subject Group Device knowledge**	**III. Subject Group Practice**		**IV. Subject Group Examination**
1-4 weeks	5-10 week	11-19 week		20-21 week
120 lessons	84 Lessons	180 Lessons		36 Lessons
ZMNDU 's campus at Szolnok	HDF.5. Bocskai István Infantry Brigade, Debrecen	HDF.5. Bocskai István Infantry Brigade, Training fields at Hajdúhadház		
Theoretical lessons and exam of basics	Theoretical lessons and exam of Device knowledge	Mission training simulator lessons	Mission preparation, training flights, mission evaluation	Final evaluation (theoretical and practical examination)

Table 6.

3.4. Basics

The first part of the training is held in Szolnok, at the Air Traffic Controller and Pilot (Aircrew) Department. The Basic subject group contains 94 theoretical and 26 practice lessons. 80% of the lessons have been granted by the professionals of the Air Traffic controller and Pilot (Aircrew) Department and the other lessons have been held by the professionals of the specific topic like electronic warfare and evaluation of air reconnaissance pictures.

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Modul	Subject	Number of lesson	
		Theory	**Practice**
Basics	Introduction	2	
	Aerodynamics	10	
	Aviation meteorology	8	
	Cartography	12	6
	Rules of the Air and procedures	8	
	Orientation is the air, Air navigation	4	6
	Air Traffic Management, Aeronautical Information Services	3	
	Air Operations (ATO, SAR)	2	
	Aviation medical knowledge	2	
	Flight Safety	6	
	Foreign Weaponry knowledge	4	
	Air law	4	
	Basics of Air reconnaissance, and its requirements	4	
	Application of Air reconnaissance	4	
	Assemblage and forwarding of Air reconnaissance reports	5	5
	Analysis and assessment of aerial photos	6	5
	Electronic warfare	4	
	Radio- telephony operator basic knowledge	4	4
	Basic theoretical examination (test)	2	
Together:		**94**	**26**

Table 7.

There is a high need to the participants to be familiar with air reconnaissance and analysis and assessment of aerial photos because this is the task they have to carry out in a mission. To be compliant with domestic and international regulation the basic subject group has to be containing the elementary information about the ATM[8] system, air low and rules of the air.[5][6]

The first instructor team (8 soldiers) have been trained in Israel during a 2x2 training course of the system. During the first two week they made so called familiarization with all systems of SKYLARK 1-LE and in the second part of the course they got basic knowledge how to be an instructor for the future UAV operators. They had the theoretical and practical knowledge to operate the device, but they did not have the

[8] *ATM: Air Traffic Management*

corresponding general and special proficiency to carry out a complex mission from the preparation until the assessment of aerial photos. They had the task to take part on the SUAV[9] training course with other participants.

3.5. Device knowledge

The second part of the training course is carried out in Debrecen at the HDF.5. Bocskai István Infantry Brigade. This module includes 84 lessons in 6 weeks and carried out by the instructors holding posts at the HDF.24. Bornemissza Gergely Reconnaissance Battalion. The instructors enlighten the capabilities of the device, the logic of the operating system and the subunits task. There are some other subjects there like servicing the device, converting maps for usage and firmware update on the UAV and on the ground station too.

3.6. Practice module

The third module is a mix of the previous two modules. During the first two weeks of training (60Lessons) there is a main familiarization with the UAV system via the so called "mission trainer" simulator. The participants' task is to accomplish different missions on the simulator using the real controller surfaces of the ground station of the system from mission planning till landing. The next step is to acquire the right sequence for the take-off. Finishing off this subject there is just one thing to do for the instructor: let the operators fly as much possible for the next four weeks (120 lessons) to get as much experience as possible for the final examination. At this part of the training soldiers have to carry out the whole mission alone unless intervention of an inspector is needed due to an emergency situation however participant should be at a good level to solve the problem alone. There are no any suggestions and helping words during the mission, it is only an after flight briefing to enlighten the possible problems during the mission fulfilment.

3.7. The method of examination and evaluation

The examination is divided into more steps during the three modules. The basic module ends with a theoretical exam which is a test, time to solve it only 1X90 minutes. The test includes all subjects of the basic module. There are different question types like answer making, answer completion and multiple choice tasks. The requirement is to reach at least 61% of the total score.

3.7.1 Device knowledge exam

This exam is at the end of the device knowledge module and it is also a complex test with answer making, answer completion and multiple choice questions in 3X45 minutes. It includes all the system describing and flight modus themes of the unmanned aerial system.

3.7.2. Practical examination

The task is to ensure that the operator is able carry out a whole mission on his own. The practical test includes mission preparation, safe ground and air operation and mission assessment also. During the flight the examinee has to use all the flight modus of the device, and the mission has to be at least 80 minutes from the take off. The training course is successful with evaluation at least sufficient. Should the examinee not pass any part (written test or oral answer) of the exam, so the final evaluation result is insufficient. In case of the examinee may not pass any of the theoretical exams, it is not allowed to carry on with the practical training and examination.

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[9] *SUAV: Small Unmanned Areal Vehicle*

There are two different positions for the operator on the practical exam:

Operator 1: (accomplish a flight mission)

Operator 2: (carry out the take off procedure)

The practical tasks are in closed envelope and the examinee has to choose one of it. The examination task includes theoretical question and a mission to carry out. The UAV instructor is responsible to evaluate given answer and the mission fulfillment of the examinee.

3.7.3. Final evaluation

The final evaluation grade is the average of the written basic exam, oral answer and the carried out mission on the UAV system. The final evaluation is successful at least with the grade of satisfactory. Of course if the participant may not pass any of the exams the final evaluation is unsatisfactory.

Exemption from the exam should be not given.

To document the examination process there is a need of a registry sheet and upon successful completion, a certificate shall be issued. The successful completion of the training is documented with a certificate, signed by the heads of participating organizations.

3.8. Experience upon the training course

We had a lot of questions upon launching the preparation for the training course. What should we teach for the participants? We had same 4experience during the previous UAV training course but to accomplish the requirement of the Operational and Training Department of the Defence Ministry of Hungary. We had to set up a more complex curriculum based on mainly the field of air reconnaissance and NATO standardization (STANAG). Not at all the device is a special kind of aircraft so we had to enlighten the related subject groups too like air traffic management , aviation meteorology, and rules of the air because those kind of subjects are generally unknown for a simple infantry soldier. Even so we could set up a good basis of subjects group covering the whole field of activity of a UAV operator.

We have to mention the "excellent" attitude of the participants, because they achieved several times excellent grades on the theoretical exams sacrificing their free time to preparation for an exam after 8 "strange" lessons a day.

The practical training has been carried out by the instructors of HDF.24. Bornemissza Gergely Reconnaissance Battalion who informed us on daily basis about the training.

We have a lot of success during the training but we have to mention the problems encountered during the practical training which where through no fault of the instructors. It came up a virus in the software of the UAV system so we had to spent weeks to let it correct by the Israeli side. We do not have training UAV so called "dummy". The trainees had to practice the take off procedure (with help of a gummy rope called bungee) of the UAV with the real device and it had been caused of course damages, dilapidation an unfortunately to the loss one of the real UAV. Upon the experience finally the HDF procured a dummy for training purposes. Another hindering factor was the available amount of UAS because some devices where in Afghanistan on live mission. It can be

stated too, we built up a very good and honest professional relation with the practical instructors and their superiors.

4. Future of the training courses

Since we let Skylark 1-LE in active troop service it provides efficient help to collect reconnaissance data for the troops serving in Afghanistan with providing human live and the loss of technical equipment. Every mission at operational areas brought lot of experience and new fields of employment. The commanders of the Peace Reconstruction Teams expressed praise about the UAV team participating soldiers. Last year the system performed it 150th mission providing important information. It is justified that the device should be in the HDF's weaponry to save more human live and to provide on-time reconnaissance data.

5. Introduction of an ongoing research related area

It is really important to set up a training course and to make professionals from people. It is more interesting to select the people to a special position. To decide who is able to learn or master something you have to select the people according special physical and medical requirements. In frame of our research project there are different working groups. One of them is the Data Integration Projects subproject on Human factors of UAV operations and the supporting legal framework.

5.1. The content of the project, Brief description of the planned R&D & activity

The project aims to examine the key elements of sorting UAV pilots, compared to the existing conventional pilot selection models. In this section of Research is necessary to clarify, selecting health and capability terms the of the UAV control staff.

On the UAV control staff imposed health and capability requirements may differ from the requirements of "traditional" pilot candidates, but there is certainly overlap between the two disciplines.

5.2. Target fields and aims of the research

Create an optimal selection system by the definition of medical requirements and competency for future UAV operators;

Define the theoretical and practical training minima and optima on the basis of traditional aircrew training syllabus;

Circumscribe the selection criteria and adequate training serving the critical competencies of UAV crews based on the traditional training methods for aircrews and air traffic controllers;

Using simulations verify the optimal characteristics (physical, qualification, professional background) of future UAV operators.

5.3. Expected findings

Reflecting to the existing legal framework unveil the possible fields for development in the UAV ops and training system;

Elaborate a proposition paper for the legislator on UAV license categories and requirements (medical, theoretical, practical);

Create an optimal theoretical and practical UAV training syllabus for TOs;

Form feasible methods for selection, training and licensing of UAV crews with an aim of attaining advanced flight safety.

6. Conclusion

It is clear that the spread of UAV's growing day to day. We know already a large scale of application in state usage of the system. To carry out different missions we need different concepts and layouts. One of our staff member Róbert SZABOLCSI derived requirements for UAV systems used in military [7], in firefighter [8] and also used in police applications [9] based on results of scientific survey organized by himself. Our Department of Military Aviation will continue the UAV operator training and also the connected research and analysis of related regulators which was realized through the assistance of the European Union, with the co-financing of the European Social Fund. "Critical Infrastructure Protection Research TÁMOP-4.2.1.B-11/2/KMR-2011-0001" it enjoys the support.

References:

[1] Palik M.: *Applicability of unmanned aircraft systems for air reconnaissance in operations of air force flying units*, PhD dissertation, Budapest, ZMNDU, 2007

[2] Koncz M.: *Onboard electronics for target of the Mistral air defence system*, AARMS, Budapest, ZMNDU, 2006, Vol. 5, No. 1 (2006) 39–50

[3] HDF OTD (5/2010) directive *„Training requirements for Unmanned Aerial Vehicle Operators"*, Budapest, 2010

[4] *"Training program (RLI/25-20/2010) for the operators of SKYLARK I LE Short Range Unmanned Aerial Vehicle"*, Szolnok, 2010

[5] *Decree 14/2000. (XI.14) of the Ministry of Transport and Water Management on the Rules of the Air within the airspace and the aerodromes of the Republic of Hungary;*

[6] *Decree 3/2006. (II. 2.) of the Ministry of Defence on rules of the air applicable within the airspace designated for the purpose of state flights;*

[7] Szabolcsi R.: *Conceptual Design of the Unmanned Aerial Vehicle Systems Used for Military Applications,* Scientific Bulletin of "Henri Coanda" Air Force Academy, No. 1/2009., ISSN 2067-0850, pp(61-68), Brasov, Romania.

[8] Szabolcsi R. *Conceptual Design of the Unmanned Aerial Vehicle Systems for the Firefighter Applications*, CD-ROM Proceedings of the 12th International Conference „AFASES 2010", ISBN 978–973–8415–76–8, p4, 27–29 May 2010, Brasov, Romania.

[9] Szabolcsi R. *Conceptual Design of the Unmanned Aerial Vehicle Systems for the Police Applications*, CD-ROM Proceedings of the 12th International Conference „AFASES 2010", ISBN 978–973–8415–76–8, p4, 27–29 May 2010, Brasov, Romania.