PERSPECTIVES OF UNMANNED AERIAL VEHICLES UTILIZATION

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Summary. The article deals with the perspectives of using of UAVs. Based on the analysis of current and future applications of UAVs examines the economic effects. Understanding the general characteristics providing the basic information necessary for analysis of the issues, the development of these technologies in conjunction with an analysis of existing applications is the basis for revealing promising future applications of these systems and their impact on the economy at regional and global scale.

Keywords: unmanned aerial vehicle; integration; history

1. INTRODUCTION

The issue of UAVs is currently highly topical, because these technologies open up a range of options for increasing the efficiency of air operations in civil and military sectors. This type of aviation technology represents one of the fastest growing segments of aviation. Continued progress in the field of these technologies is becoming a driving force for further development and opens up unprecedented opportunities for their applications. Despite its short existence, unmanned aerial vehicles experienced incredibly rapid development and become a full part of the air forces. In many areas today, unmanned aerial vehicles manned outperform their contemporaries.

2. HISTORY AND PERSPECTIVES OF UNMANNED AERIAL VEHICLES UTILIZATION

This article examines the characteristics of UAVs. UAV is a motor-powered aircraft without a human crew on board and their flight using aerodynamic forces.
The main characteristic of UAVs is no onboard crew or passengers.
UAV system consists of:

- unmanned vehicle and equipment,
- ground control station,
- drainage and launchers (if needed),
- management system,
- data transmission system,
- transfer device for one or more UAV. **Chyba! Nenašiel sa žiaden zdroj odkazov.**, [2]

The issue of division UAVs into groups is considerably difficult. Unmanned aerial vehicles are still under development and many are designed for specific tasks. The basic division means the military and civilian.

The earliest recorded use of an unmanned aerial vehicle for warfighting occurred on August 22, 1849, when the Austrians attacked the Italian city of Venice with unmanned balloons loaded with explosives. Unmanned aerial vehicles were used in the First and Second World War. A major breakthrough in the use of unmanned aircraft occurred during the Vietnam War when these machines developed into all sorts of shapes and structures. They included the use of a wide range of tasks

ranging from exploration to sharp fighting flight. For these purposes were equipped with all sorts of machines and instruments. The main users were the United States in this war which were looking for variety ways to deal with opponents.

Unmanned aerial vehicles should preferably be implemented in the area of defense technology and its main users are the armed forces of the individual countries of the world. However, we can also see tendencies infiltration of these technologies in the civilian sector. A typical example of these trends, the continued use of disarmed aircraft MQ-9 Reaper security forces guarding the US border with Mexico.

A major problem of civil UAV deployment is now mainly legislation in the field of deployment. This is a big problem for further growth in this sector as well as the interest of both sides - states and private companies. **Chyba! Nenašiel sa žiaden zdroj odkazov.**-[6]

2.1. The current situation of civil unmanned aerial vehicles

In Europe, we see many projects dealing with integration of unmanned aerial vehicles into civilian air traffic. The aim of these projects is to reduce Europe's decline against the US and Japan in the use of these technologies. In the United States perform tasks related to UAV patrolling border areas and Japan help rotor UAV in agricultural work especially spraying crops. Australia, the typical use of UAVs to patrol the coastal areas. It's just that Australia has become a leading country in the regulation of civilian applications. [3], [7]

To achieve safely operation of unmanned aerial vehicles is necessary to deal with technical problems related to their operation in the airspace. In order to achieve coordination and unification of technical standards is essential to adopt the necessary legislation which also serve to control and superve of the execution of all technical requirements. In general, we can conclude that there is no comprehensive legislation for civil use of UAVs. During the whole history the organization the license was granted only twice to the type of Altair UAV from General Atomics and Eagle Eye UAV from a Bell Heli. A variety of unmanned aerial vehicles using the airspace and operating under military authorizations and regulations just in the absence civil law. [7]

FAA is the main entity participating in the the creation of regulations and standards on aviation. Regulations issued by the organization are abbreviated as FAR.

Opinion of the European and Social Committee on the Safety of Air Navigation dated 19 January 2006 in accordance with Article 29 (2) of its Rules of Procedure, decided to draw up an opinion on aviation safety. The European Aviation Safety Agency (EASA) must carefully consider whether to allow suppliers of equipment authorize any element independently, without the involvement of either the European Aviation Safety Agency and aircraft manufacturers. 9[7]

Nowadays, the Slovak legislation any regulations exist that address the issue of using unmanned aerial vehicles in civilian sector. UAV currently operate in the airspace under licenses issued by the Civil Aviation Authority of the Slovak Republic. [7]

Using unmanned aerial vehicles in the airspace of the European Union as a priority for military and experimental purposes paves the way for the expansion of these resources to the civil area. To manage these resources successfully integrate to the civilian sector, it is necessary to overcome several problems. This are particularly the political barriers, economic barriers, social barriers, environmental barriers.

ASD (Aerospace and Defence) created in 2006, a Working Group Certification and Qualification UAV-s dealing with certification and airworthiness UAVov which issued the outline development plan for the integration UASov to EU airspace. The curriculum includes greater participation interested parties in the development plan, outlining the schedule and budget forecasts costs for required activities. Based on studies were determined technical and legal barriers.

2.2. Activities of European organizations engaged in the use of UAVs in airspace EU

Last years represented a period of extended initiatives in the area of UAVs. These efforts following organizations reflect national, international, military or civilian interests of the integration UAVs in EU airspace.

- ✓ International Civil Aviation Organization (ICAO) - The organization produces documents so-called Annex. This Annex consists a set of standards and recommendations for underlying the national rules. Annex 3 of those has particular importance for the operation of UAVs. This is particularly the Annex 1, Annex 6, Annex 8. [7]

- ✓ Study Group of ICAO unmanned aerial vehicles (ICAO UAS Study Group) - This group plays the role of global contact point for the development of definitions and terminology, and other non-technical aspects related to the activities of the UAV. The group is composed of representatives of the 18 states and 9 international organizations. [7]

- ✓ European Organisation for the Safety of Air Navigation (EUROCONTROL) - This international governmental organization ensures the safety of operation and service of international air transport, control and coordination of air traffic in airspace over Europe, optimize flight routes and creating efficient air traffic management system. [7]

- ✓ JAA/EUROCONTROL Task Force - The task of this working group is to deal with the concept of civil law for unmanned aerial vehicles, dealing with issues of security, capability, maintenance and licensing. [7]

- ✓ The North Atlantic Treaty Organization (NATO) - It is an organization bringing together countries in order to protect the interests of its members, military and political means. Member States retain their sovereignty. The North Atlantic Alliance currently has 26 members, including the Slovak Republic. The main objective of this group is the expansion of the scope of organization NATO's international operations UAVs in the unallocated or civil airspace. [7]

- ✓ European Commission - This organization represents the interests of the European Union and participates in the adoption of rules which are submitted to the Parliament and the Council. The Commission can control the policy of the European Union in cooperation with the Court applies the European Union legislation. The Commission also represents the European Union in negotiations at the international level. [7]

- ✓ Project INOUI (Innovative Operational UAV Integration) - Relevance of this project is to provide plan regarding the future of UAVs in the context of a changing environment ATM. The project also focuses on the complementary activities of the Single European Sky, which does not address the issue of UAVs. This project can be seen as an attempt by the European Community for research and development to solve the problem of integration of UAVs into the structures of the ATM 2020. The conclusions that will be the output of this project should set the framework for operation of UAVs in Europe that helped the development of the industry of UAVs. [7]

2.3. Trends in the use of UAVs

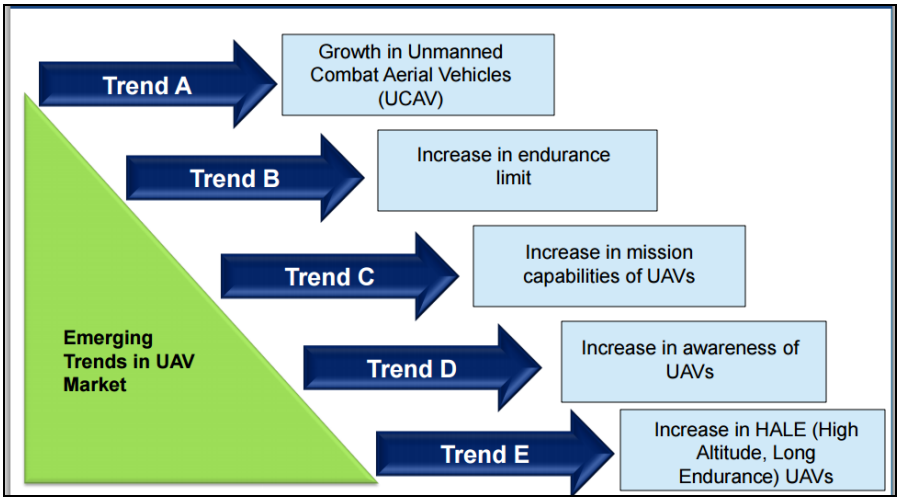

Figure 1 Emerging trends in UAV Market

UCAV is a new segment - products in UCAV segment are new and have a long way to go for further development . It is anticipated that a fully developed UCAV product will take another decade.

Global HALE UAVs is an attractive market with total opportunity of US $1.1 Billion in 2010. It is accounted for 36% of the global UAV market. Market growth was 16% (CAGR) during 2005- 2010 and is expected to increase 9% CAGR from 2011-2016, to reach US $ 1.3 Billion in 2016.

UAVs used for civil and science purpose such as natural disasters, humanitarian relief, environment, weather and storm tracking. Data captured from disasters or crises areas. Outstanding for sensitive areas such as hurricanes. Used for precise data collection. [7]

UAVs can perform dangerous missions without risking human life. Unmanned Aerial Vehicles (UAVs) are systems for intelligence, surveillance, and reconnaissance and weapon delivery. They provide significant value in high-risk situations where the presence of a pilot in the aircraft is risky. UAVs can be a smart and cost-effective complement to traditional manned aircraft.

In 1995, maximum loitering time was 24 hours. According to the process of modernization and improvement of technical parameters f UAV reached maximum 60 hours. Solar powered UAVs have a demonstrated endurance of more than 300 hours. [7]

The total UAV opportunity is expected to surpass US $7 billion over the next 10 years, driven by increasing UAV demand and UAV procurement. Increase in demand is expected in the HALE segment of UAV market. Degree of technical change will be very high in the UAS market in the coming years o Latest innovation: Solar powered UAV have endurance of more than 300 hours. UAVs are in development for a number of future roles that could greatly expand their numbers. Military uses will include the delivery of food, medicine and other supplies for troops.

North America continues to be leading global UAV market with 60% - 70% followed by Asia Pacific and Europe with 20 % and 16 % respectively. There has been a significant increase in demand for UAVs from emerging countries, currently used in more than 50 countries. [7]

2.4. The economic impact of application UAVs

For a better identification possibilities of using UAVs first they are defined their basic features.

UAV

- UAVs are remotely piloted or self-piloted aircraft that can carry cameras, sensors, communications equipment or other payloads.

- UAVs are smaller than manned aircraft and therefore more easily and more cost-effectively stored and transported.
- UAVs make significant contributions to the fighting capability of operational war forces.

Blimps

- A blimp (technically called a "pressure airship") is a powered, steerable, lighter-than-air vehicle A blimp has no rigid internal structure; if a blimp deflates, it loses its shape
- Blimps are simply shaped balloons.
- Blimps are best known today for their role as advertising and promotional vehicles.

Zeppelins

- Zeppelins are rigid or semi-rigid airship. Zeppelins have rigid metal skeleton, making them suitable for longer trips .
- Zeppelins were used for passenger transport as well as for military purposes [7]

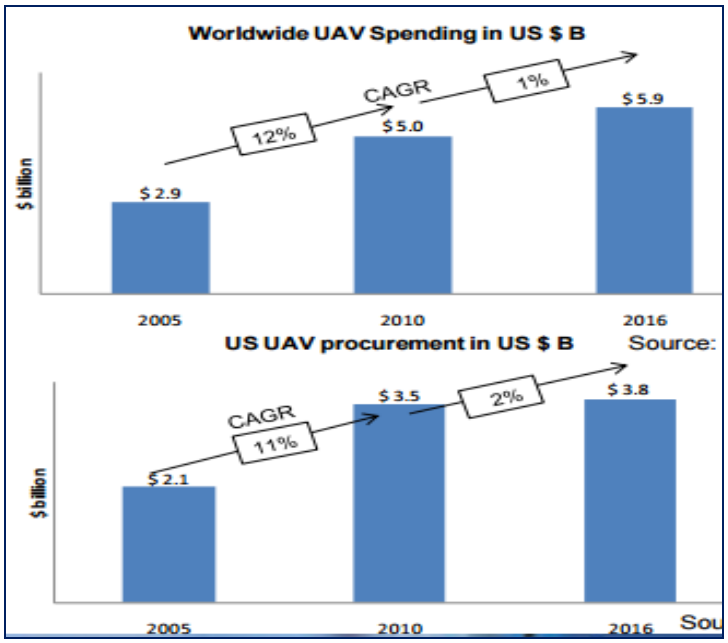

Figure 2 UAV Spending

Expected growth in world UAV market dominated by growth of US UAVs 2 % in the next 5 years. UAV Market spending will increase from $5 billion in 2010 to $5.9 billion in 2016. Approximately half of the expenditure of UAV market spent for procurement and another half spend for Research and Development activities. [7]

UAV spending across the globe has received increased attention after the terrorist attack on World Trade Center in 2001 o US Department of Defense increased its funding for UAV programs significantly after the attack.

Increase in UAV budget during the years 2009 to 2011. Growth during the period comes from the USA and Europe. Spending for UAVs tends to come primarily from defense budgets. U.S. share in 2008 in the UAV market is 60 %, whereas the U.S. share in total worldwide defense spending is about 48 % in 2008. [7]

The economic benefits of implementing the UAS are huge. Firstly, it is necessary to determine the number of vendors who offer their products at the UAS. Then define the supplies needed for their production. Depending on the cost of labor is determined by the number of direct jobs created. Using these factors, we expect tax revenues. [7]

The economic impact of UAS is based on the theory that investment flowing into the local economy outside benefit the regional economy. Financial return per capital is in the form of new jobs, earnings and new tax revenues. The initial development of the new company generated expenses due to commissioning and subsequent use. This raises the positive externalities, market operators have advantages, which are themselves not reimbursable. When employees spend money in local businesses, such as restaurants, gas stations and retail outlets. From their spending will benefit not only business owners but also their employees thus creating a positive incremental impact. [7]

2.5. Marketing analysis

Homeland security unmanned aircraft system (UAS) markets grow as governments worldwide realize these affordable airplanes provide a less expensive way to provide defense of a nation's borders and deterrent to intruders. These markets are poised to grow based on the creation of new services efficiencies that accrue from improved technologies. New composite materials systems are achieving consistent price declines throughout the forecast period. [7]

Homeland security and commercial unmanned aircraft system (UAS) are used by countries to protect their borders and get aerial views of commercial projects. Complex systems include ground stations and other elements in addition to the aircraft. UAS are used by the International Civil Aviation Organization (ICAO) and other government aviation regulatory organizations. [7]

Unmanned aircraft systems (UAS) are achieving a level of relatively early maturity. Fleets of unmanned aircraft systems have begun to evolve. The U.S. Army has achieved one million flight hours for its unmanned aircraft systems fleet. This market maturity is anticipated to extend the usefulness of the technologies into homeland security and commercial markets. Unmanned aerial systems have good handling characteristics. Units are designed to perform high-speed, long-endurance, more covert, multi-mission intelligence, surveillance, and reconnaissance (ISR) and precision-strike missions over land or sea. [7]

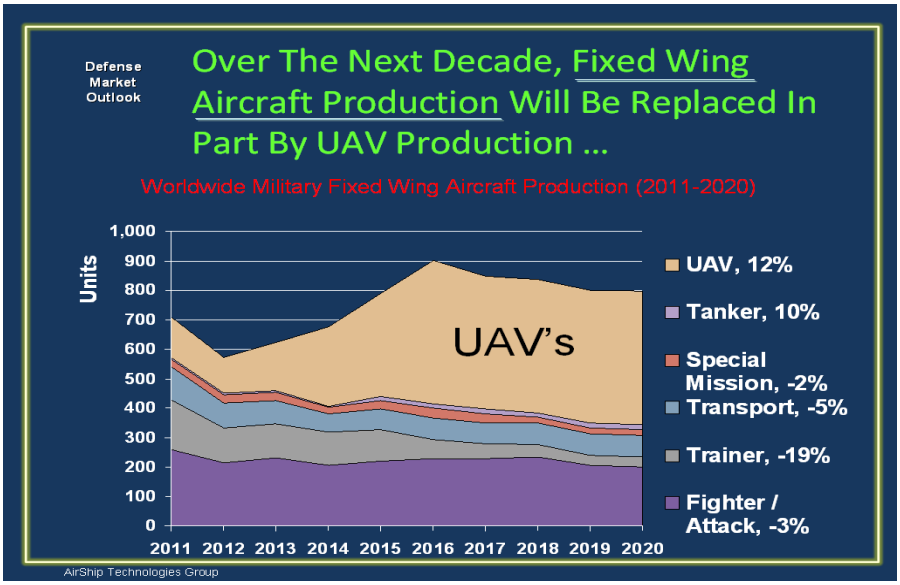

Figure 3 Military UAV Production

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