

ANALYSIS ON THE LEADING TRENDS AND CAPABILITIES OF UAV'S AND THEIR APPLICATION IN THE EUROPEAN COOPERATION PROJECTS

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Abstract

The European Defense Agency (EDA) is the key institution of the European Union in the implementation of the Common Security and Defense Policy (CSDP) resource provision measures. The Agency has set objectives in the field of military resource development, defense research and development, pan-European cooperation projects on armaments, strengthening the industrial and technological structure and as a key direction, the creation of a joint competitive market for military and dual-use products. Significant progress has also been made in the area of unmanned aerial vehicles (Remote Piloted Aircraft Systems, RPAS). The aim of the project is to introduce unmanned aerial vehicles (UAVs) into the internal airspace. The Agency coordinates the interaction of the UAV national operators, the European Commission represented by the Directorate-General for Mobility and Transport and the European UAV Leading Group.

Keywords: European defense agency, military integration, unmanned aerial vehicles, European cooperation projects.

1. INTRODUCTION

The EOA is the key institution of the European Union in implementing CSDP resource provision measures. The Agency has set many objectives in the fields of military resource development, defense research and development, pan-European armamen cooperation projects, bolstering the industrial and technological infrastructure and as a main objective the creation of a joint competitive market for military and dual-use products. In order to achieve the goals set by the EOA, strategic initiatives have been approved, which have become the conceptual basis for this body's activities. Despite that however, over the last ten years the Agency has failed to achieve serious results as it has only made partial progress in that direction.

2. ANALYSIS ON THE CAPABILITIES OF UAV'S AND THE LEANING TRENDS IN THEIR APPLICATION

One of the new and promising ways to improve the combat potential of the armed forces is to create and implement a new kind of military equipment in the face of unmanned aerial vehicles (UAV) in the processes involving military training and possible military operations. UAVs are designed and manufactured particularly for intelligence-related tasks (including reconnaissance and target recognition), although there are increasing efforts to accomplish, a number of other tasks such as information gathering, critical for political decision making during crisis situations; radio and radar reconnaissance; radiation, chemical and biological reconnaissance; detection of mines and mine field locations. Furthermore, UAVs can be used for radar and radio jamming; naval and ground artillery fire correction and target acquisition, surgical strikes against

ground targets (in the future against aerial targets as well); jamming of enemy air defense; post fire mission analysis; missile defense including the detection and destruction of high value targets; data transmission; collecting meteorological information, etc.

Unmanned aerial vehicles set up in the US and Western Europe have been used in military operations in the Persian Gulf, the Balkans, Afghanistan, Iraq, and the military conflict with Georgia in South Ossetia. In order to coordinate UAV operations taking place in different NATO member states, a number of documents are planned to be developed that include a UAV ground station standard and the necessary UAV tactical and technical characteristics.

In order for NATO to develop a tactical unmanned Navy intelligence system, NATO plans to work with several countries. According to one of the possibilities for such cooperation Germany will provide intelligence UAVs for this intelligence system, USA - will provide a tactical control system and the UK - data transmission equipment. Since the mid-1990s, there has been a growing interest in the creation of unmanned aerial vehicles.

The analysis of local conflicts from the second half of the XX and the beginning of the XXI century creates new requirements for military operations in which high-tech weapons and military equipment are increasingly involved. Ever more increasing applications find the technologies where there is no crew involved and at a certain point in their development, the weaponry becomes hi-tech and is now radio guided. Unmanned aerial vehicles as a tool for modern conflicts first "Debuted" in 1982 over the Beck Valley during the conflict between Syria and Israel. The Syrian army had a strong anti-air system build by Soviet military experts. Even for the Israeli Aviation, which at that time was equipped with modern American equipment and had a solid combat experience in previous wars, this was a serious challenge. Nevertheless, Israel, using UAVs, was able to locate Syrian air defense systems. Using the data gathered from the UAVs, Israeli planes delivered a powerful blow to the Syrian air defense system in the Beck Valley. As a result, 18 Syrian rocket batteries were destroyed (Antonov, Hristozov, 2017; Terziev, Petkova - Georgieva, 2019b).

Since then, the world's interest in UAVs has steadily grown. This is manifested, in particular, in increasing the number of publications on the creation and use of UAV complexes, the involvement of an increasing amount new countries in UAV development, the continuous growth of the tactical and technical characteristics of the developed complexes, and the finding for new and different applications. Since the mid-1990s in the United States and Western Europe have taken a significant role in conducting research assigned to military UAVs as one of the priority directions for the development of aviation technology. As a result of US military operations in Kosovo in 1999, there has been an increased awareness of the objective inevitability of creating UAVs for both the US and leading European countries, including US allies in NATO.

The analysis from the military operation in Yugoslavia suggests that the further increase in efforts within the current understanding of the military might of the United States is no longer achieving the desired results. There is a need to replace military pilots with unmanned aerial vehicles in order for payload to be effectively delivered on target. Despite that however, according to foreign experts there are at least three reasons for a less clearer and sufficient prioritized approach of Western European countries towards the creation of UAVs carrying armament payload:

- The overall lag of European countries compared to the United States in the development of UAV technology;
- The difficulties ensuring the safe use of UAVs on the European continent in the already overloaded air traffic management system;
- The lack of sufficient vast spaces like deserts suitable for use as testing grounds for UAVs.

The state of UAV creation currently has an organized process of research and design work funded by the military departments of a number of Western countries, including work on the creation of UAVs with high-precision weapons (Antonov, Tsonev, 2016; Stoev, Zaharieva, Borodzhieva, 2019). Nowadays an army that does not possess sufficient amount of unmanned aerial vehicles and is not capable of utilizing them efficiently is not considered modern. These factors determine the ability to clarify the views about the role and place of UAVs in each country's armed forces system, in order to evaluate the prospects for the development of these weapons and military equipment. The quality indicators of the weaponry, reconnaissance, communications and autonomous guidance systems (CAY) determine the effectiveness of the combat operations methods. The use of unmanned aerial vehicles for military purposes has become one of the important development directions for the modern aviation allowing for the automation of the controlled units for a reduction of personnel lost in battle due to the received intelligence on the current situation.

According to the level of task required UAVs are supposed to support piloted aircraft in situations when the increase of the capacity of the latter is impossible or irrational. The task of creating and expanding a fleet of unmanned aerial vehicles has another equally important cause. This cause is the fact that UAVs in their function to provide individual combat task support to the Air Force are an alternative to manned aircraft, which in modern conditions can be preferred according to a number of criteria. Strengthening the capabilities of the Air Force is possible through the development and production of (or purchase of foreign) UAVs which cost less compared to manned aircraft, including construction costs and maintenance of the ground based equipment and personnel training. Personnel training can be conducted in conjunction with cadet training in the Aviation Faculty of "Georgi Benkovski" Air Force Academy. Thus, the use of UAVs will increase the capabilities of manned aircraft and reduce the cost of fleet maintenance.

The correctness of the developed theoretical concepts is evidenced by the conclusions from past military operations in the Middle East, where despite some technical delays during the development of UAVs by the leading world forces, the armed forces of Russia and Syria have brilliantly applied the theory in practice, using predominantly intelligence UAVs. The Russian group in Syria includes about 80 UAVs, from light to heavy UAVs. Their number exceeds the total number of manned aircraft and helicopters. Such quantity of UAVs radically increased the intelligence capabilities of Russian troops. The successful use of UAV's lies in their implementation in all branches of the military. UAVs are used in the Navy not only for fleet fire correction but also for the interests of the Ground Forces (Antonov, 2017). Unmanned aerial vehicles support air strikes with aerial means for destruction, fire correction and reconnaissance. UAV video footage allow for a crew action evaluation, position of government forces, enemy position locations and fire coordination in the evolving situation. The above listed aids tremendously the cooperation between different units and troops of the armed forces. This in turn allows for a complete monitoring of the combat operations area.

UAVs equipped with radar and optical equipment can be utilized for many battlefield operations the accomplishment of which will be impractical with manned aircraft due to a number of economical, technical and other reasons.

These operations include ground, water and airspace monitoring, environmental control, air traffic management, control of maritime navigation, development of communication systems being reconnaissance and observation of heavily guarded infrastructure or targets in which are part of the combat operations area as well as areas with wild fires, flooding act. (Stoev, Zaharieva, Mutkov, 2019a). The monitoring of areal and ground conditions with UAVs is connected with monitoring and videotaping a ground area. During the flight in a certain area, the UAV is capable of transmitting reconnaissance information through radio waves in real time (or close to real) towards a modular communication system, which manages and processes information.

Another equally important direction in the use of UAVs is against the enemy anti-aircraft defense (AAD), including radar installations. Unmanned aerial aircraft have remarkable advantages against radar guided air-to-air missiles "AAM" due to the duration of their flight operation the ability to deploy different sensors and exchange information with the operator in real time. The prospect of utilizing UAVs as a strike option and as an effective means of countering enemy anti-air defense.

The main efforts in the use and development of UAVs should be directed into the creation of a low-cost, multifunctional device with modern navigation equipment and control systems.

The increasing demands for better quality radar and optical images obtained with UAVs, which necessitates the development of new, and / or modification of already existing methods and algorithms for image processing further highlighting the urgency of the problem.

Thus, in the context of troop control automation it is critical for an armed force to possess modern drones that are able to perform the full range of required tasks. Modern military operations are unthinkable without UAVs and the prospects for their development are enormous.

An analysis on the UAVs research development shows that the key features that determine the appearance and combat utilization of promising aeronautical systems for unmanned combat aerial systems are:

- Utilization of joint combat use of both manned aircraft and unmanned aerial vehicles in a combined structure of the tactical aviation;
- Ensuring the safe flight operations of UAVs in civil airspace including the possibility that the UAV can return and land with unused weaponry payload;
- Allocation of control functions between the operator located in the control center and the on-board system for automatic control of UAVs;

- Providing sufficient situational information required for use-of-force decision making.

3. PAN-EUROPEAN COOPERATION PROJECTS

In recent years, the EAO has been able to launch and partially implement a number of pan-European projects aimed at simplifying the harmonization of standards and accessibility in the defense industry markets for European manufacturers. Such database projects are Procurement Gateway and e-Quip, initiated by the EAO as information resources for national defense departments and defense industrial enterprises, including small and medium-sized enterprises engaged in the supply and production of military and dual-use products.

The Procurement Gateway system provides access to regulatory and technical documents for all 27 (Denmark does not participate in the EAO) countries participating in the EAO regulating the purchase of military products. The main objective of this project is to facilitate the combined access of small and medium-sized enterprises in the field of defense industry to the markets of the EU Member States by providing "navigation" through a large set of regulatory documents in this field. However, the system only provides access to documents in the national language, without providing translation, which complicated the work with the documents.

In 2013, the e-Quip system was launched allowing for the exchange of information between potential sellers and buyers of defense industry products. This is an online platform where you can track the online supply of defense products across the EU. All EU countries with a surplus of military equipment and weapons which are typically formed at the end of military and peacekeeping operations regularly update the information in the system and enter relevant product data (Terziev, Bankov, Georgiev, 2018; Terziev, Petkova - Georgieva, 2019c).

Significant progress has also been made in the area of unmanned aerial vehicles (Remote Piloted Aircraft Systems, RPAS). The goal of the project is to introduce unmanned aerial vehicles (UAVs) into the internal airspace. The Agency coordinates the interaction of the UAV operators on a national level, the European Commission represented by the Directorate-General for "Mobility and Transport" and the European UAV Management Group. According to the European Roadmap for Integration of Civil Pilot Systems into the European Aviation System, their gradual implementation and use in EU airspace should start by 2016. According to Philippe Leopold leading resource development officer at EAO, work is underway for the creation of a workgroup for UAV operators in Europe that will include mid-altitude Reaper UAV specialists, mid-air collision avoidance systems developers (Mid -Air Collision Avoidance System (MIDCAS) and satellite systems allowing the intergation of UAVs in Europe (Demonstration of Satellites enabling the Insertion of RPAS in Europe, DeSIRE). The DeSIRE program is a joint project of the EAO and the European Space Agency, implemented by the Spanish company Indra. It tests UAVs in Spanish airspace using satellite control and surveillance, communications and air traffic management systems and data transmission systems to ground stations. Member States' investments in the project amount to 50 million euro. The results of the project implementation should be the development of joint standards for the training of UAV operators, the harmonization of national laws governing the use of UAVs in airspace, standardization of certification requirements and the development of an effective collision detection and prevention system (sense and avoid) (Terziev, Bankov, Georgiev, 2018a; Terziev, Arabska, Dzhumaliev, 2016a; Terziev, Dzhumaliev, 2015; Nichev, 2009).

In addition to those projects which are essentially targeted at the creation of a joint market, work is also being done towards the creation of a specific pan-European resources. These include the development of A400M military transport aircraft and the production of refuel tanker planes with two Air-to-Air refueling systems. EU operations show that the transport aviation and refueling are one of their key connections while cooperation in this field is least developed: despite the obvious problem only seven member participate in the project and are able to deliver only 30% from the required number of refuels. But at the same time, European governments have not abandoned parallel bilateral and multilateral interstate projects. For example, under intergovernmental agreements between France and the United Kingdom, Italy and Germany, cooperation continues in various fields, including the creation of UAVs. In 2009, Finland, Denmark, Iceland, Norway and Sweden signed a Memorandum of Understanding on Defense Cooperation (NORDEFECO project), identifying the competitiveness of their defense industry complex as one of their priorities. And this leads to duplication and misallocation of resources (Terziev, Dzhumaliev, 2016b-e; Stoykov, 2011-a; Stoykov, 2002; Stoykov, 2003; Stoykov, 2005).

For the years of its existence, the European Defense Agency has been able to identify major gaps in the provision of resources from the Common Security and Defense Policy, to formulate policy priorities in this

area that are enshrined in strategic initiatives, and to launch a number of pan-European projects. In defining problems and priorities, the EOA is based on the goals and objectives of the CSDP and the European Security Strategy, which is its conceptual basis. The ESS identifies the major threats to the security of the European Union and the challenges it will face in the medium term. In order to counteract these threats and challenges for the EU, it is necessary to radically review security approaches, notably in the area of engagement of Member States' armed forces in joint operations and their resource support. The strategies developed and approved by the Agency are the result of a systematic analysis of the current state of the Member States' military-industrial complexes and related compatibility issues. The objective of the strategy is to harmonize product standards in the defense industry, to enhance the compatibility of weapons and control systems, to maintain the competitiveness of the EU's industrial and technological base, and to develop advanced dual-use military and technology (Terziev, Bogdanova, Kanev, Georgiev, 2019b-d; Petrov, Georgiev, 2019e; Terziev, Georgiev, 2017b; Terziev, Nichev, 2017c-i; Terziev, Nichev, Bogdanov, 2017j-k).

4. CONCLUSION

The first real results from the implementation of the strategic initiatives will be clear in a few years although intermediate results can be seen today like the implementation of projects such as e-Quip, Gateway Procurement, the integration of civilian UAVs in the internal airspace. Strategic initiatives of the European Defense Agency are consultative in nature and are often referred to as guidance and therefore differ from national strategies by their non-binding nature. Thus, they are a set of programmatic documents to be followed in determining the priorities of national defense programs and military research and development. The lack of a unified EOA strategy is due to the degree of integration in this area. This institute has significant potential that can be utilized by the increase in the integration and broader supranational functions Agency functions in the field of defense and security. Increasing funding for pan-European weaponry research and development projects and the involvement of all Member States in the process of building a common market for military and dual-use products (Terziev, Madanski, Georgiev, 2017l-m).

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