



The Effectiveness of the Use Unmanned Aerial Vehicles in the Process of Performing Aviation Work in Ukraine and the Factors of Their Formation

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**The effectiveness of the use unmanned aerial vehicles
in the process of performing aviation work
in Ukraine and the factors of their formation.**

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Abstract. The purpose of this work is to determine the effectiveness of the use of unmanned aerial vehicles in the process of performing aviation work and to determine the factors of formation of the unmanned aerial vehicles's body.

Today, one of the most important problems of our time, which needs attention and decisive action, is the problem of protecting our country from military aggression. Protection can be performed in a variety of ways, one of which is the use of remote control methods and automatic actions to increase security.

This work attempts to answer the question how effective of unmanned aerial vehicles using to protect the country and what factors of formation are taken into their design.

Unmanned aerial vehicle - an aircraft without a crew on a board. It is designed for aerial photography, monitoring, surveillance, data collection, and high-precision weapons.

There are numbers of different classifications of unmanned aerial vehicles:

- by type of appointment;
- by type of management system;
- on the principle of flight;
- by flight parameters;
- by type of wing;
- in the direction of takeoff and landing;
- by type of take-off;
- by engine type and fuel system.

Key words: Unmanned aerial vehicle, monitoring, efficiency, technology, formation factors.

1. Development of the use of unmanned aerial vehicles in Ukraine.

In modern aviation, one of the most important areas is the development of unmanned aerial vehicles.

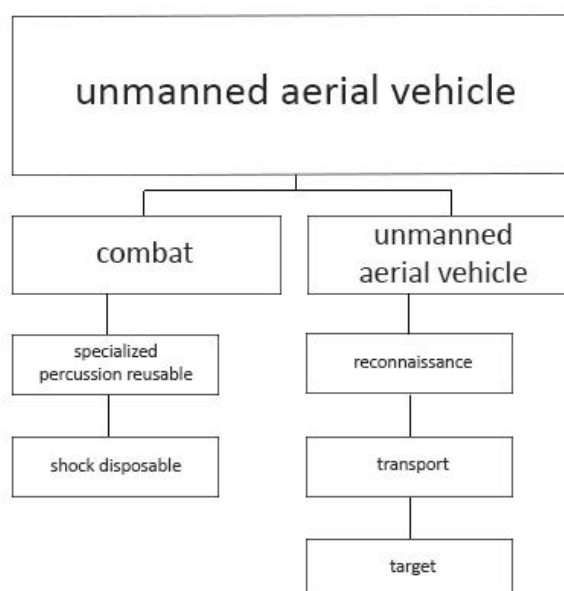
The modern complex of unmanned aerial vehicles is a high-tech system with elements of artificial intelligence, integrated into the all-military system of information gathering and decision-making. Unmanned aerial vehicles are the part of a rather complex technical system - unmanned aerial vehicles with ground control points, information processing, communications, transportation and loading of unmanned aerial vehicles and their operation. Thus, unmanned aerial vehicles are not just a modern class of flight aviation, but also a qualitatively new, higher level of development of military aviation.

The success of their application is primarily due to the rapid development of microprocessor technology, control systems, navigation, information transmission, artificial intelligence. Advances in this field make it possible to fly automatically from takeoff to landing, to solve the problem of monitoring the earth's (water) surface, to provide reconnaissance, search, selection and destruction of the target. Therefore, in most industrialized countries, a wide front is being developed for both the aircraft itself and power plants for them. According to foreign experts, more than 250 models of unmanned aerial vehicles are currently being developed and manufactured in 32 countries.

2. The principle of operation and classification of unmanned aerial vehicles.

An unmanned aerial vehicle repeatedly realizes its functional purpose without directly placing a person on board for control purposes. The common concept has a fairly broad meaning, so this class does not include unmanned modifications of serial aircraft used as air targets, as well as all types of ballistic and cruise missiles.

Modern functional classification methods used by foreign military analysts are based on the primary difference between combat unmanned aerial vehicles and unmanned aerial vehicles. (pic. 1)



Pic. 1 – general classification of unmanned aerial vehicles

The greatest attention in the development of combat strike unmanned aerial vehicles is paid to specialized reusable strike vehicles, which in their tactical and technical characteristics are approach to modern tactical fighters. Such devices will be part of the first echelon of air strikes and will be used in front of cruise missiles and combat aircraft.

Unmanned aircrafts of safety are differentiated as intelligence, whole and transport

platforms. Transport platforms in essence is the protectors of development intelligence.

Tactical development of unmanned airborne aircraft is recognized for the security of development of information on parts and strikes of land forces in the corps and below, as well as parts and strikes of the military-naval forces. In a number of countries, tactically developed unmanned airborne aircraft also stagnate against the melancholy of the military forces.

There is also a classification of unmanned aerial vehicles by organizational characteristics and technical characteristics. However, the list of these features not only shows the unique possibilities of flexible use of unmanned aerial vehicles, but also dictates need to have a comprehensive set of systems.

Classification by organizational characteristics:

- by scale of application (strategic, operational, tactical);
- by affiliation (land forces, navy, aviation, border troops);
- by reusable (reusable, disposable);
- by control method (operator control, automatic control, combined control system).

Classification by technical characteristics:

- by overall weight characteristics (miniature, ultra-small, small, medium, large);
- according to the aerodynamic scheme (aircraft type, helicopter type);
- by start method (catapult type, run by hand, run from the runway);
- by method of landing (airplane, parachuting, catching by various devices);
- by the time of receipt of the collected information (in real time, periodically during communication sessions, after landing);
- by type of base of the launcher (ground, air, sea);
- by height of application (supermall heights, small heights, average heights, height);
- range of action (ultra-short-range, short-range, medium-range, long-range);
- by flight duration (small, medium, large).

The principle of operation of unmanned aerial vehicles depends on its design features. Most modern unmanned aerial vehicles meet several layout schemes:

- Fixed wing. In this case, the devices are close to the aircraft layout, have rotary or jet engines. This option is the most fuel-efficient and has a long range;
- Multicopter. These are screw machines equipped with less as two motors, capable of vertical takeoff / landing, hovering in the air;
- Helicopter type. Helicopter layout, propeller systems can be different, for example, often equipped with coaxial propellers, which is related to models with machines such as "Black Shark";
- Convertible. It is a combination of helicopter and airplane scheme. To save space, such machines are lifted into the air vertically, the configuration of the wing changes in flight, and the aircraft method of movement becomes possible;
- Gliders. These are mostly devices without motors, which are dropped from a heavier machine and move along a given trajectory. This type is suitable for reconnaissance purposes.

The power plant is mounted in a case, there is control electronics, controls and communications.

The collection of information for the operator and the software of the machine itself comes from different types of sensors. Laser, sound, infrared and other types are used.

Navigation is carried out by GPS and electronic maps.

Incoming signals are transformed by the controller into commands that are already transmitted to the executing devices, such as the rudder.

3. The effectiveness of using unmanned aerial vehicles in the process of performing aviation work in Ukraine.

The main feature of unmanned aerial vehicles is the absence of human aircraft on board, which reduces the risk of combat losses of highly qualified aircraft, remove restrictions due to congestion and the impact of harmful factors on humans.

Experience of practical military application of unmanned aerial vehicles in different countries in military, anti-terrorist operations and conflicts, when performing a number of civilian tasks allows to formulate a list of tasks, determine the types and organize the classification of unmanned aerial vehicles. Military tasks in importance, complexity, special conditions and other extreme factors are superior to civilian, and

therefore the main trends of modern and future development of unmanned aerial vehicles are associated primarily with military purposes.

In the conditions of military aggression in Ukraine, unmanned aerial vehicles allows destroying enemy targets without endangering highly qualified aircrew. Ukraine has many engineering centers, plants and equipment that can be adapted to produce its own unmanned aerial vehicles and not expect them to be available from neighboring countries. But, first of all, there are people in Ukraine: leading engineers, industrial designers, designers and technical experts who want to develop technology to protect their country.

The following are the main organizations of Ukraine capable of developing unmanned aerial vehicles to varying degrees:

- Kharkiv State Aviation Production Enterprise;
- "Chuguiv Aircraft Repair Plant";
- military enterprise "Communar";
- KHAI, Avia Design Bureau;
- Open Joint Stock Company CB "Zlit" (Kharkiv);
- Open Joint Stock Company "Motor-Sich" (Zaporozhye);
- State Enterprise "Ivchenko-Progress" (Dnepropetrovsk);
- State Enterprise "Orizon-Navigation" (Smila);
- Ukrtechno-Atom Enterprise;
- Yuavia Limited Liability Company (Kyiv);
- Joint Design Bureau "TEKON-Electron" (Lviv).

The list of state-owned enterprises and organizations of enthusiasts speaks of a fairly solid scientific, technical and technological potential in Ukraine, which due to lack of public funding attractiveness for investment in private business and short-sighted policies may lose its relevance.

However, the current state of problems requires the definition of priority areas for the development of unmanned aerial vehicles in Ukraine, which will stimulate the development of scientific and production potential of Ukraine in the development and creation, which is not fully used.

During the years of independent Ukraine, no ministry or agency has been able to order and complete the development of unmanned aerial vehicles, despite the existence of scientific, production and testing organizations capable of developing and producing mini and tactical unmanned aerial vehicles, and this is the main problem.

4. Factors of formation unmanned aerial vehicles.

The following factors are taken part into account when designing unmanned aerial vehicles:

1. Functional factor.

Under the function is understood the work to be performed by an industrial product. The influence of the functional factor on the form, therefore, is determined by the requirements that people put forward to the usefulness of the subject. On the one hand, the industrial product is directly related to humans. On the other hand, it is an element of the subject environment. Therefore, according to the functions to be performed by the unmanned aerial vehicle, the design of its fuselage must take into account the laws of aerodynamics, speed and flight range.

2. Ergonomic factor.

The influence of ergonomic factors on the shape of the unmanned aerial vehicle is determined by the requirements for the convenience and safety of use of the device.

3. Aesthetic factor.

The aesthetic factor of shaping is related to the composition, that is, from the aesthetic organizations of the work. The main task of this organization is to achieve conformity of the form to the content. On the other hand, it is the integrity of the shape of the product.

4. Construction factor.

To understand the relationship between form and structure, all industrial products can be divided into two groups: the first includes objects with a hidden structure, their external forms are formed by surfaces, various enclosures that cover the structure and the second group, objects with open structure. Therefore, an unmanned aerial vehicle is a device with a hidden design, and this must be taken into account when designing.

5. Technological factor

Forms of industrial products are made from different materials. Each material has certain physical properties. No less important in terms of impact on the shape is the method of processing the material. The shape of the unmanned aerial vehicle will also be affected by the method of assembling the object together with its components.

6. Factor of destruction.

The final process that an industrial product goes through its life is destruction. Once a product has fulfilled its purpose, it becomes inconvenient and uninteresting. Therefore, it should be designed so that it can be easily disassembled or destroyed later. It is necessary to include in the project such materials which in due time will facilitate process of destruction and do not harm external environment. Designing an industrial product, it is also necessary to consider the possibility of reusing materials or parts of the product.

Thus, the problem of relevance of design and production of unmanned aerial vehicles in Ukraine is considered. But this problem cannot be solved without state support. It is necessary to create a design bureau for the production of unmanned aerial vehicles in Ukraine on the basis of existing productions, to develop special software, as well as to create service centers and training centers for relevant specialists.

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