Cases on Modern Computer Systems in Aviation

Tetiana Shmelova, Yuliya Sikirda, Nina Rizun, and Dmytro Kucherov

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Chapter 3
Using Unmanned Aerial Vehicles to Solve Some Civil Problems

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EXECUTIVE SUMMARY

The widespread use of unmanned aerial vehicles (UAVs) is currently a recognized trend. UAVs find their application in various sectors of the economy. In the chapter, based on extensive literature analysis, the possibilities of using UAVs for non-military applications are considered. The design features of various UAVs, their control features, energy requirements, and safety-related problems are considered. Particular attention is paid to public opinion related to the use of UAVs. The possibilities of using UAVs in power engineering, agriculture, for controlling traffic, for goods transporting, for controlling the means of railway transport, for first aid to people under various extreme conditions, as well as for some other applications are being explored. The UAV parameters are analyzed, which must be provided for their use in each specific case, while ensuring the minimization of the necessary financial resources.

BACKGROUND OF UAVS

The initial history of the development of UAVs was related to their use for military purposes. The page (History, 2018) notes that the first practical use of UAVs was in 1849 during the suppression of the Venetian insurrection by the Austrian army. In this case, unmanned balloons stuffed with shrapnel were used.

The use of winged aircraft as a drones is associated with the name of the American inventor Charles F. Kettering (Charles, 2018). Kettering designed the "aerial torpedo", nicknamed the Kettering Bug. The sources cited above indicate different years of the creation of this invention (1910, 1914 and 1918). It was a radio-controlled bomb, created on the basis of a fairly primitive winged aircraft. Despite the fact that it was not possible to test this device in military conditions, the "Bug" is considered the first aerial missile. A total of 45 Bugs were produced, one of which is currently in the National Museum of the United States Air Force in Dayton, Ohio.

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As the first unmanned reusable aircraft, De Havilland DH82B Queen Bee (De Havilland, 2018) can be considered. This aircraft, created for the Royal Air Force and the British Navy was used as a flying target. There were specimens with the possibility of landing on a ground surface or on a water surface. A total of about 1,000 aircraft were manufactured.

In the article (Benchoff, 2016) it is noted that the history of the emergence of the word "Drone", which is now commonly used for the name of UAVs, is most likely connected with this aircraft. In English, the words "Drone" and "Queen Bee" are used to describe the representatives of the bee family. Accordingly, we can assume that the word "Drone" has been in use since 1935.

Unguided aircraft were created and widely used during the Second World War and in the prewar years. The history of their creation and use is described in detail in the book (Everett, 2015).

Currently, drones have found numerous areas of use for non-military purposes. This chapter will be devoted to the examination of existing possibilities for using drones in various areas of human activity.

Modern Terminology

An aircraft is a flying object that can move or stay in a near-Earth atmosphere. It is used to transport people and loads (Dobryakova & Ochin, 2016). According to the definition of Unmanned Aerial Vehicle (UAV), it is an air-powered object that performs flight using aerodynamic force, without having a pilot on board and not transferring passengers. Such a device is often called a drone, which is a synonym. Due to the fact that unmanned aerial vehicles are an element of the system in which they operate, it is more accurate to describe the Unmanned Aerial System (UAS). This system, in addition to the aircraft itself, consists of other elements that are on the ground and are necessary for flights (Burdziakowski, 2016).

These elements are:

- Control station (it includes system operators, devices supporting interoperability of teams, interfaces and other elements of control);
- Communication systems between the unmanned aerial vehicle and the devices mounted on it, and the control station;
- Auxiliary equipment for servicing and transporting system components (Bujnowski, 2017).

Also introduced was the concept of Remotely-Piloted Aerial System (RPAS), which according to the decision of the International Civil Aviation Organization (ICAO) is able to meet the requirements set in civil aviation, which allows it to be allowed to fly in space air. A remotely piloted aircraft system to perform operations in non-dedicated airspace must be able to detect other airspace users and be capable of taking adaptation. In other cases, the operations of these systems must be limited to the separate airspace (Burdziakowski, 2016). In Polish regulations, the person piloting the aircraft system remotely is the operator of the unmanned aircraft, while the person who operates the aircraft model is the pilot-operator of the flying model. The division into unmanned aerial vehicles and flying models results from the purpose of their use. Structures used for sports or recreational purposes are referred to as flying models, while when used for other purposes they are called unmanned aerial vehicles. In the European Union, operations of unmanned aircraft used for civil purposes are regulated by technical criteria, which include the criterion of mass and equipment of the internal combustion engine. On this basis:

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