

ANALYSIS OF REMOTE-PILOTED VEHICLES USE AND CONTROL SYSTEM DESCRIPTION

© Markiv V., 2016

Йдеться про необхідність використання безпілотних літальних апаратів у різних сферах життя. Зображено схему системи управління безпілотними літальними апаратами, що описує структуру процесу управління. Підкреслено переваги застосування безпілотників у сучасних умовах. Визначено основні завдання щодо покращення метрологічного забезпечення безпілотних літальних апаратів. Наведено класифікацію безпілотних літальних апаратів. Проаналізовано використання безпілотників.

Ключові слова: безпілотний літальний апарат, система управління, метрологічне забезпечення, метрологічні індекси, повітряна фотозйомка.

The article dwells upon the necessity to use the remote-piloted vehicles in different spheres of life. The scheme of remote-piloted vehicle control system is presented, which describes the structure of control process. The advantages of the remote-piloted vehicles use in modern conditions are highlighted. The main tasks of remote-piloted vehicle metrology supply improvement are given. The classification of remote-piloted vehicles is presented. The analysis of remote-piloted use is made.

Key words: remote-piloted vehicle, control system, metrology supply, metrology indices, aerial photoshooting

Introduction

Nowadays information society develops very fast. It is the main peculiarity of the modern scientific and technological progress stage. New scientific prospects become visible and acceptable. One of the perspectives is the use of remote-piloted vehicles in different spheres of life. It is really justified. Many countries use remote-piloted vehicles for different purposes concerning aerial photoshooting and terrestrial researches. It is the effective mean of reconnaissance. Modern remote-piloted vehicles use new technologies, cameras, radars, infrared detector and others.

Also, in modern conditions Ukraine is faced with the problem of terrorism in the temporarily occupied territories. Therefore, reconnaissance plays important role for military operations. The use of remote-piloted vehicles is the best and the safest way of territory research. So, it is really urgent to analyze the use of remote-piloted vehicles and the control system, which will help to improve the exactness of territory observation.

The main problems

Nowadays, the remote-piloted vehicles are used in various spheres. That is why, it is necessary to know the peculiarities of such use for the further improvement. The remote-piloted vehicles are used in the following cases [3,4,5,6]:

- military aerial photoshooting;
- movies photoshooting;

- TV series;
- festive event;
- natural disasters (radiation accidents, fire, flood).

Despite the fact that the remote-piloted vehicles are very popular in modern conditions there are some problems, when using them in different kinds of researches. Taking this fact into consideration the improvement of remote-piloted vehicles metrology supply accuracy, processing speed and data transmission is very important. It is necessary to improve the control and localization of remote-piloted vehicles by improving metrological measurements based on the reduction of the metrology errors.

The aim of research

Therefore, the main problem of the research is to use remote-piloted vehicles in an appropriate way regarding peculiarities and characteristics and metrology supply. Because it is impossible to imagine the operation of product without measurement assurance.

The remote-piloted vehicles are the most effective, mobile, convenient and cheap means of exploration. For this purpose, it is necessary to highlight the following objectives:

- 1) to analyze the use of remote-piloted vehicles;
- 2) to present the main classification of remote-piloted vehicles;
- 3) to describe the control system of remote-piloted vehicles.

The remote-piloted vehicle use analysis

It is known, that the remote-piloted vehicle it is the device under continuous remote control of pilot or pilotes and the main aim of which is to be returned to airfield for the repeated use. There are different types of remote-piloted vehicles concerning the main peculiarities and use characteristics.

The classification of remote-piloted vehicles is really important/ because it helps to choose appropriate device for the research. It is possible to classify remote-piloted vehicles according to technical and organization features. Such classification is made according to the following parameters [2,8,9]:

- **type of control:**
 - vehicles without control;
 - vehicles with automatic control;
 - remote-piloted vehicles;
- **full flight weight indices:**
 - **I class** – full flight weight up to 150 kg;
 - **II class** – full flight weight up to 600 kg;
 - **III class** – full flight weight more than 600 kg
- **use possibilities:**
 - multiple use;
 - single use;
- **target destination:**
 - reconnaissance;
 - fight;
 - multiple targets;
- **type of start:**
 - manual;
 - catapult;
 - flight line;
- **flight height:**
 - low height ($h < 1$ km);
 - middle height ($1 < h < 4$ km);
 - high height ($4 < h < 12$ km);
 - stratosphere ($h > 12$).

Nowadays, the use of remote-piloted vehicles is urgent. It becomes more and more interesting for researchers. That is why, the classification is really necessary for the solutions of problems concerning the terrestrial and aerial studies. Also, it is important to know the control system of remote-piloted vehicles.

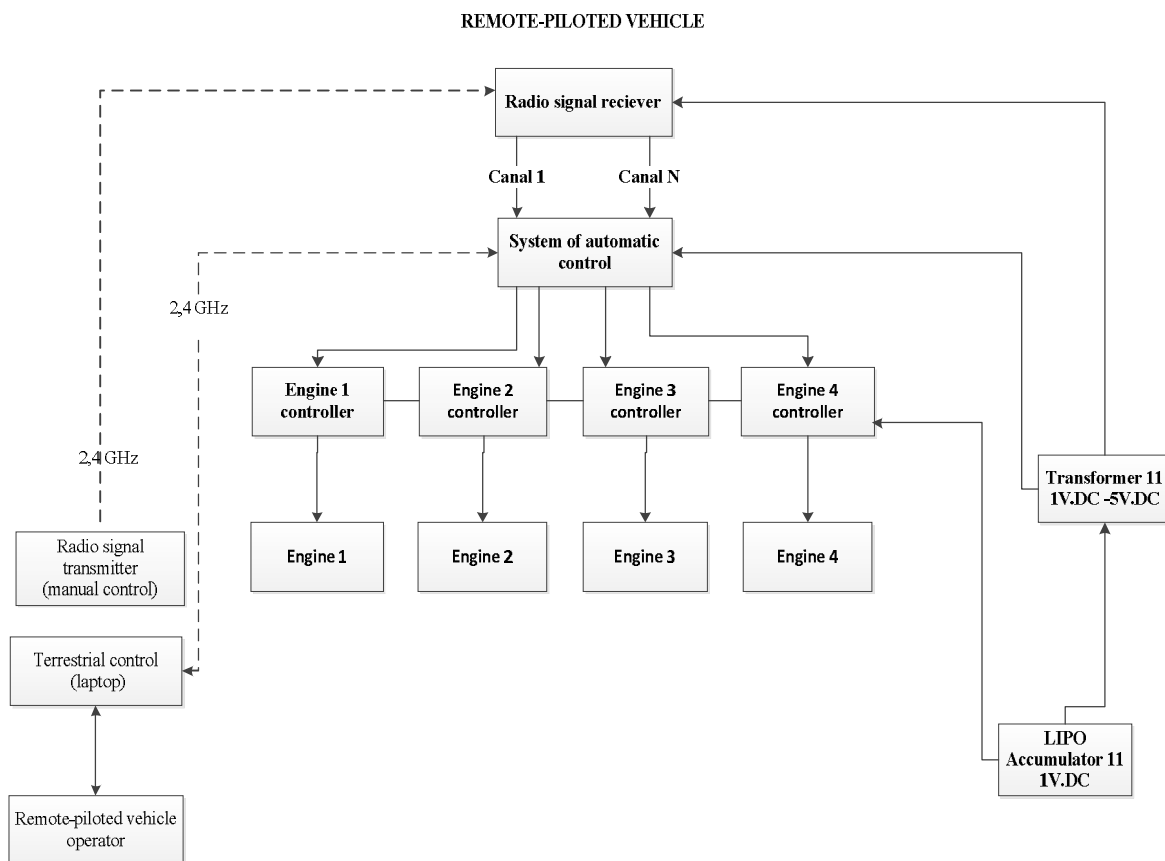
The remote-piloted vehicles control system

The progressive improvement of production development, techniques, technologies causes the necessity to use new methods of reconnaissance in different regions. Therefore, the remote-piloted use is the best method, as it was highlighted previously. The remote-piloted vehicles during flight are under the influence of a variety of factors:

- weather conditions (wind direction, humidity, temperature);
- radio barriers level;
- relief of region;
- atmospheric pressure.

That is why, the main problem regarding remote-piloted vehicles use is precise control and transmission of data at long distances. For this purpose, the main task of remote-piloted vehicles is to make the reconnaissance of the regions where it is difficult to obtain information with the help of other means. The remote-piloted vehicles control it is complex problem, which provides the improvement of theirs use in different spheres.

In order to use remote-piloted vehicles in appropriate way it is also important to understand the control system structure. It is presented in fig. [1, 2, 7].



Remote-piloted vehicle control system

Such scheme demonstrates that the control system of remote piloted vehicles consists of radio signal receiver and transmitter, terrestrial control and remote piloted vehicle operator. Also, such control is based on the engines controllers.

There are different types of remote-piloted vehicles control system:

- manual control when remote-piloted vehicle is under the control of a pilot;
- automated control when the control is made based on the telemetric data;
- automatic control when the control is made based on the system chosen parameters.

So, the use of remote-piloted vehicles has such advantages [4, 6, 9]:

- *high economic efficiency* (the use is not very expensive, it is even cheap and available for different purposes);
- *aerial photoshooting low altitude* (in order to obtain precise images of the region, it is possible to make aerial photoshooting at 10-200 m.);
- *exactness of aerial photoshooting* (the detail photoshooting of little objects and areas, where it is impossible to do the research with the help of other means).

The use of the remote-piloted vehicles in different sphere of photoshooting is justified based on the described advantages.

Conclusions

The remote-piloted vehicles use is extremely important in modern conditions, taking into consideration the present situation in Ukraine. It is necessary to develop new methods of remote-piloted vehicles control system quality improvement based on the metrology supply. It will provide better quality of remote-piloted vehicles control.

It is urgent to use the remote-piloted vehicles for the aerial photoshooting of different areas and events. Because, it helps to obtain information from different remote regions. It is mobile and cheap method of photoshooting. That is why it is really necessary to use remote-piloted vehicles based on classification according to features and peculiarities.

Therefore, it is necessary to make the further researches by analyzing the existing problems regarding the control of remote-piloted vehicles. Also, it is important to develop metrology supply mathematical model and to improve metrology supply indices measurement of remote-piloted vehicles control based on the practical realization.

1. Алексеев В. Беспилотные летательные аппараты – на службу армии и народного хозяйства [Электронный ресурс] / Алексеев В. // Голос Украины. – 12.06.2009. – № 107. – Режим доступу: URL: <http://www.golos.com.ua/Article.aspx?id=136248>
2. Балыков Ю. Комплексы с беспилотными летательными аппаратами – оружие будущего // Национальная оборона. – 2008. – № 1. – С. 8–14.
3. Бейлін М. В. Системний підхід до постановки на озброєння безпілотних авіаційних комплексів / Бейлін М. В., Бурковський С.І. // Системи управління, навігації та зв'язку. – 2008. – № 6(2). – С. 60-61
4. Зинченко О. Н. Беспилотные летательные аппараты: применение в целях аэрофотосъемки для картографирования (часть 1) / Зинченко О. Н. // Ракурс. – 2011. – С. 1–12
5. Матійчик М. П. Тенденції застосування безпілотних повітряних суден в цивільній авіації / М. П. Матійчик, І. А. Качало // Матеріали XI міжнародної наук.-техн. конфер. “АВІА 2013”. – 2013. – С. 97.
6. Павлушенко М. И. Беспилотные летательные аппараты: История, применение, угроза распространения и перспективы развития / М. И. Павлушенко, Г. М. Евстегнеев, И. К. Макаренко // Научные записки ПИР-Центра. – 2004. – № 2 (26). – 612 с.
7. Трубников Г. В. Беспилотные летательные аппараты и технологическая модернизация страны / Трубников Г. В., Воронов В. В. // Экспорт вооружений. – 2009. – № 4. – С. 11–20
8. Харченко О. В. Погляди на термінологію сфери безпілотних літальних авіаційних комплексів військового призначення / О. В. Харченко, С. О. Богословець, Ю. В. Коцуренко // Наука і оборона. – 2008. – № 4. – С. 57 – 60.
9. Харченко О. В. В. В. Кулешин, Ю. В. Коцуренко. Класифікація та тенденції створення безпілотних літальних апаратів військового призначення / О. В. Харченко, В. В. Кулешин, Ю. В. Коцуренко // Наука і оборона. – 2005. – № 1. – С.47–54.