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**USE OF UNMANNED AERIAL VEHICLES
IN THE INTERESTS OF EMERCOM OF RUSSIA**

Analysis of issues of the use of unmanned aerial vehicles in the interests of the Emercom of Russia is carried out. Some features of the unmanned aerial vehicles that will affect the decision making of the Ministry of emergency situations of Russia are shown.

Key words: emergency, unmanned aerial vehicles, robotics complex, search and rescue.

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**ПРИМЕНЕНИЕ БЕСПИЛОТНЫХ ЛЕТАТЕЛЬНЫХ АППАРАТОВ
В ИНТЕРЕСАХ МЧС РОССИИ**

Анализируются проблемы применения беспилотных летательных аппаратов в интересах МЧС России. Показаны некоторые особенности применения беспилотных летательных аппаратов при решении задач, возложенных на МЧС России.

Ключевые слова: чрезвычайная ситуация, беспилотный летательный аппарат, робототехнический комплекс, поиск и спасение пострадавших.

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The importance and complexity of the decisions that challenge the *Ministry of the Russian Federation regarding Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM of Russia)* are determined by the specific features of the Russian Federation: the vast territory for the relatively low average population density and its high concentration in large cities and regions that experience natural *emergency situations (ES)* (earthquakes, floods, typhoons and hurricanes, large forest fires, landslides, avalanches set, etc.).

High risks associated with the threats of man-made emergencies and disasters associated with prolonged wear and aging of basic production capacities. The greatest threats are accidents at the nuclear facilities and major chemical plants located in close proximity to human settlements.

The oil and gas pipelines are very long; accidents in them can lead to a large amount of casualties, large-scale pollution of the environment as well as to large economic losses since the export of natural gas is a significant share of foreign exchange earnings of the country's budget.

The potential danger is the considerable deterioration of the housing stock, which is the cause of large fires causing numerous casualties and considerable material losses.

Because the Russian Emergencies Ministry lacks human resources, there is a need to preserve the health and lives of the rescuers themselves in difficult circumstances of large man-made disasters that often include radioactive, chemical and biological objects that require finding the most effective and safe ways to improve the prevention, detection, containment, and emergency response.

Under these conditions, the best course of action would be the use of advanced technology, integrated use of forces, means, and methods aimed at the prevention, detection and localization of emergencies in the early stages of their emergence and spread.

Implementation of the basic tasks of the Russian Emergencies Ministry is associated with a great risk, requiring the highest training of personnel and the use of high-performance hardware. Preventing emergencies and locating them in the initial stages of their development is the most important task in the development of new technologies, as well as the shapes and methods of their application.

In order to monitor potentially dangerous territories and areas of industrial facilities, robotic systems, capable of real-time transmission of information to authorities about the condition of said areas for prompt and adequate measures, should be used.

As mentioned earlier, the use of *unmanned aerial vehicles (UAV)* in the interests of the Russian Emergencies Ministry is very important.

The unmanned aircraft equipment is booming. Many countries are currently using them for different tasks, having a variety of aerodynamic configurations with large spectrum of performance characteristics.

The success of their application is associated primarily with the rapid development of the microprocessor computer technology, control systems, navigation, communication, and artificial intelligence. Achievements in this area make it possible to carry out the flights in automatic mode, from takeoff to landing, thus solving the problems of monitoring Earth's (water) surface, also unmanned aerial vehicles for military purposes can provide reconnaissance, search, selection and destruction of targets in difficult conditions. Therefore, most industrialized countries are developing both the unmanned aircrafts and the power plants required to make them run.

Currently, unmanned aerial vehicles are widely used for NFM Russia crisis management and the obtainment of operative information. They are capable of replacing planes and helicopters during the execution of tasks related to the risk of lives of their crew and the possible loss of expensive manned aircraft. The first unmanned aircraft arrived in the Russian Emergencies Ministry in 2009. In the summer of 2010, unmanned aerial vehicles were deployed to monitor the fire situation in the Moscow specifically on the Shatura and Yegoryevsk regions.

In accordance with the Resolution of the Russian Government dated eleventh of March, 2010 № 138 "On approval of the Federal Rules of use of the air space of the Russian Federation" for unmanned aerial vehicle meant aircraft operating without the pilot crew on board and controlled in flight automatically by the operator from the console, or a combination of these control methods [1].

UAV is designed for the following tasks:

- unmanned, remote monitoring forests to detect forest fires;
- monitoring and gathering data on radioactivity – and chemical contamination in certain areas and airborne transmission in a given area;
- surveying areas for floods, earthquakes, and other natural disasters for engineering purposes;

- detection and monitoring of ice jams and river floods;
- monitoring the state of oil and gas pipelines, power lines, and other facilities;
- ecological monitoring of water areas and coastlines;
- determination of the exact coordinates of the affected areas and emergency facilities.

Monitoring is carried out during the day and night, usually during favorable weather conditions. In addition, the UAV is capable of location car- accident victims (catastrophe) or the like, and the missing or lost persons. Search is conducted on a pre-flight scheduled route that is entered or changed by the operator. The UAV is equipped with guidance systems, airborne radar systems, sensors and cameras.

During the flight, as a rule, the management of unmanned aircraft is automatically carried out by the on-board navigation and management system which includes:

- satellite navigation receiver capable of receiving information from navigation systems GLONASS and GPS;
- a system of inertial sensors capable of detecting the orientation and motion of the unmanned aircraft;
- a system of sensors capable of measuring the height and airspeed;
- different types of antennas.

On-board, the communication system operates within the permitted range of radio frequencies and provides data transmission from the UAV to ground and ground to UAV.

The tasks for the use of unmanned aerial vehicles can be classified into four main groups:

- detection of emergencies;
- participation in emergency response;
- search and rescue;
- assessment of the damage caused by disasters.

Once the UAV locates an emergency it books the emergency as fact, it also books the time and space of the emergency according to its observations. Air monitoring of areas using unmanned aerial vehicles is based on projections of an increased probability of disaster, or signals from other sources. This could be flying over forests in fiery weather conditions.

Depending on the speed of the propagation of an emergency, the data is either transmitted in real time or after the return of the UAV. The data can be transmitted over communication channels (including satellite) to the headquarters of the search and rescue operation of the Russian Emergencies Ministry and the central office of the Russian Emergencies Ministry.

Unmanned aerial vehicles could be included in the ranks and resources of emergency response units, and can be extremely useful and sometimes essential for the search and rescue operations over land and sea.

Unmanned aerial vehicles are used for assessing the damage from disasters in cases where haste and accuracy is essential, without risking the health and lives of rescue teams.

So in 2013, unmanned aerial vehicles were used by employees of EMERCOM of Russia to monitor the flood situation in the Khabarovsk Territory. With the help of data that was transmitted and monitored in real time of protective structures to prevent damage to the dam, as well as search for people in flooded areas with subsequent adjustment actions of the Russian Emergencies Ministry.

Considering the experience of unmanned aerial vehicles in the interests of the Russian Emergencies Ministry, the following generalizations can be made:

- the economic feasibility of the use of unmanned aerial vehicles is due to the ease of use; the ability to take off and to land on any desired territory;
- the operational headquarters receives reliable video and photographic information to efficiently manage the forces and means of localization and liquidation of emergency situations;
- the ability to transfer video and photo information in real time to control centers can quickly affect the change in the situation and make appropriate management decisions;
- ability of manual and automatic use of unmanned aerial vehicles.

In accordance with the Regulation "On the Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Disaster Relief" EMERCOM of Russia is the only authoritative body on the federal level, the Office of the Unified state system of emergency management [2]. The effectiveness of such a system is largely determined by the level of its technical equipment and the precise organization of the interaction of all of its constituent elements.

In order to resolve the problem of collection and processing of information in the field of civil defense, prevention of population and territories from emergency situations like fire hazards, increase in the safety of people at water bodies, as well as sharing this information it is important to develop technologies that will allow bases, located in outer space, air, on land, or on water, to be built.

The time factor is crucial in the planning and implementation of measures that will go to protect the population and territories from emergency situations and fire safety. The level of economic damage from disasters and the number of affected citizens greatly depends on a timely relay of information about emergencies to the leadership of the Russian Emergencies Ministry and various levels of rapid response. At the same time in order to make appropriate operational decisions, it is necessary to submit complete, objective, and reliable information that is accurate and not distorted or modified because of the subjective factors.

Thus, the further introduction of unmanned aerial vehicles will contribute significantly to filling information gaps regarding the dynamics of the disaster. The most crucial task is the discovery of a disaster. The use of only one unmanned aircraft can be very effective against slowly developing disaster or emergency situation especially when in relative proximity to the deployment forces or means that are capable of its elimination. Thus, combined with data from other means such as that from outer space, ground or water surface-based, information can be presented in detail and can then show the whole picture of upcoming events, as well as the location and severity of an emergency situation.

It is urgent and crucial to equip the EMERCOM of Russia with new robotic systems. Development, production and implementation of such equipment is quite a complex and capital-intensive process, however, the cost of such equipment will be covered by the economic effects of prevention and liquidation of emergency situations. Russian Federation suffers enormous economic losses from fires alone. Consequently, the Russian Emergencies Ministry is upgrading and retrofitting the programs designed to enhance units of EMERCOM of Russia with modern technologies and equipment for the years of 2011 through 2015.

Analysis of the response of control units and the federal forces in the emergency situations of the summer-autumn floods in 2013 in the Far Eastern Federal District stressed the relevance of the use of unmanned aerial vehicles in the interests of the Russian Emergencies Ministry; in connection with this, a decision was made to create a division of unmanned aerial vehicles.

Along with this, there are a number of problems that must be addressed before the unmanned aircraft will be widely distributed; among them is the integration of drones in a way that will not pose a threat to manned aircraft, mainly in terms of collision technology for both civilian and military purposes. In carrying out the specific rescue operations, EMERCOM of Russia has the right to use its facilities [3]; In this regard stringent regulatory restrictions or bans of use of unmanned aerial vehicles in the interests of the Russian Emergencies Ministry are nonexistent. However, the issue of legal regulation of the development, production, and application of unmanned aircraft in general has not yet been resolved.

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