Application and Management of UAV in Emergency Response

Lizhi Lin[1], Fajian Xu[2]

[1]School of Technology, Fuzhou University of International Studies and Trade, Fuzhou, Fujian, China, 350202, China

[2]Department of Computer and Information Security Management, Fujian Police College, Fuzhou, Fujian, China, 350007, China

Abstract

Unmanned aerial vehicles (UAV) are widely used in the emergency response work in 2020 in broadcasting propaganda, communication communication, non-contact temperature measurement, intensive batch processing in need of resources, detection and escort, grid refinement information control and other aspects. In case of emergency, the application of UAVs needs to strengthen management methods and measures such as no-fly zone management, flight reporting and record filing, temporary requisition, safety of UAVs propaganda content, radio monitoring, detection and suppression, etc. At the same time, the preparation of control plan and the construction of long-term mechanism should be done well.

Keywords

emergency response; UAV control; Public safety.

1. Introduction

With the progress and maturity of UAV technology, UAV gradually penetrates into all walks of life in the civil field. UAV has been widely and deeply applied in many fields, such as express freight, emergency rescue, aerial photography mapping, agricultural plant protection, electric power patrol, monitoring and supervision, environment and animal protection.

The flight and movement of UAV is stable, accurate and safe, so it can be recognized and promoted in civilian. For example, UAV needs reliable balance and stability, accurate control in distance, speed, acceleration, direction and height, and can withstand rain, dust, high temperature and other adverse environmental conditions and sudden mutation. In addition, some UAVs for specific purposes should also have some special sensors to monitor the environment and collect data (characteristics of the Internet of Things), and networking function is an important factor for the controllability and intelligence of UAVs. Drones can be controlled via a simple smartphone, remote control or directly from the cloud, providing a suitable solution for networking functions. Based on the above advantages, UAV has been widely used in emergency situations such as emergency response in 2020, and the UAV emergency Rescue Alliance has also been established nationwide.

2. Application of UAV in Emergency Period

In emergency situations such as emergency rescue, in order to respond quickly and avoid contact, the working mode of "UAV +" can be tried. The "UAV +" mode is flexible and convenient in the working process, with good mobility, wide activity coverage and free from restrictions such as terrain and space, which can effectively improve the efficiency of emergency rescue and control, reduce the work intensity and reduce the psychological pressure of staff. Therefore, it is necessary to summarize the application of UAV in emergency period, which is helpful to

promote the scientific and intelligent development of emergency response and urban management. Here is a summary of some of the applications of UAVs in times of emergency.

(1)Applications in radio publicity and communications;

(2)Delivery of materials and non-contact temperature measurement services;

(3)Centralized and rapid batch processing, transfer of urgently needed resources;

(4)Crack the asymmetric information situation, break regional panic, strengthen grid, refined situation control;

(5)Complete site monitoring, detection, escort and other complex tasks;

(6)Further targeted development of custom specific solutions.

3. The Application of UAV in Emergency Needs Corresponding Management Methods and Measures

The number of UAV users is already very large. While "UAV +" helps the emergency response, it is also necessary to strengthen the management of UAV application, so as to prevent people with ulterior motives from using UAV for destructive activities. Therefore, in terms of UAV supervision, some targeted methods and measures are needed to ensure the management and use of UAV during emergency control.

(1)UAV flight report shall be prepared for record, and flight records shall be kept for future reference

Although the existing UAV control measures do not need to declare and approve the flight plan of micro UAV, they can strengthen the management of flight report and record and flight record keeping for future reference during the emergency prevention and control period. For UAV equipment of some key units and individuals, flight recorders can be installed or flight video graphics can be uploaded to ensure timely and accurate grasp of their flight dynamics.

(2)Temporary requisition of civilian UAV equipment and recruitment of flight volunteers

In an extraordinary period, there is a great demand for the application of UAV, and emergency prevention and control and emergency response staff are not enough. Therefore, relevant measures can be taken to temporarily requisition civilian UAV equipment and recruit flight volunteers for the prevention and control work, so as to make use of collective strength to cope with the difficulties together. For example, in a certain region, parents seek for volunteers with their own equipment to participate in the prevention and control work of UAV flight within the region, which solves the problem of insufficient equipment and personnel in a short time.

(3)Strengthen the safety management of UAV propaganda content

It is more convenient and quick to use drones for broadcasting propaganda, which influences a wide range, is easy to be learned and imitated, and is also easy to be used by extremists. Therefore, it is necessary to strengthen management in terms of safety and traceability of propaganda content, so as to ensure correctness of propaganda content and spread positive energy. Digital watermarks can be added to the propaganda audio and video materials, or information such as the person responsible for communication and the source of information can be included in the broadcast voice, for example, "I am the number 3 broadcaster of the community, working code 123", which is more reliable and convenient for the audience to check and hold accountable afterwards.

(4)Strengthen the radio monitoring, detection and suppression of drones and other control means

According to relevant regulations of the Ministry of Industry and Information Technology, frequency bands 840.5mhz ~ 845MHz, 1430MHz ~ 1444MHz and 2408MHz ~ 2440MHz are used for unmanned aircraft systems. The radio control of UAVs mainly refers to the signal

control of these frequency bands, which can be used to interfere with UAVs' operating signals and control UAVs.[1]

UAV countermeasures system can be equipped in some key protected areas, so as to timely find common UAV and carry out identification and early warning. Besides, it is also necessary to determine its frequency (to prepare for the next step of radio interference and suppression) and locate the position of its remote control. In addition, further control measures should be taken for the threatened UAV to suppress remote control signals, satellite positioning and navigation signals, etc., so that it can be forced to land quickly and effectively.[2] Prevent drone crashes from injuring or attacking targets such as human sites.

(5)The establishment and control of the no-fly zone

By using administrative measures to require relevant UAV manufacturers to establish no-fly zones in airspace such as important sites and airports, manufacturers can directly fix the no-fly zones in fixed positions in the map loaded by drones, or add new no-fly zone data by upgrading firmware.[1] For the temporary dynamic no-fly zone, signal suppression and control can be used to achieve it.

(6)Set up a temporary UAV management team

Due to the specialty and particularity of UAV application, relevant departments should also set up a temporary MANAGEMENT team of UAV to manage and deal with the affairs related to UAV application. The functions of the team include accident handling and support, technical support, monitoring and coordination, etc., and it also needs a certain amount of equipment, technology and talent reserve, so that it can deal with various accidents and emergencies calmly.

4. Preparation of Control Plan

The use of intelligent motor tools such as UAV can replace human to complete a lot of high-risk work, and is safe and efficient. It can also solve the problem of insufficient equipment and personnel, and reduce dangerous contact and fatigue overtime; Combined with Internet of Things technology, UAV can also develop more and more complex prevention and control schemes for specific regions, epidemic prevention needs and scenarios. Therefore, we should flexibly combine the application of UAV and make more control plans, so as to better improve the utilization rate of personnel and materials and enhance our combat effectiveness.

For example, large-scale inspection and control should be carried out in areas with high human flow, such as expressways, stations, bazaars and villages. In the control scheme, the advantages of UAV should be fully utilized to improve efficiency. The UAV carries out cruise detection through customized routes, and USES intelligent cameras for real-time image recognition to accurately calculate the number of people in each visual field. The upper limit of the number of people can also be preset for early warning. If the number of overweight is warning trigger control plans, drones fly automatically close crowd, infrared temperature measurement with high precision equipment for on-line non-contact temperature measurement, abnormal sure no fever, can combine to broadcast emergency response knowledge, publicity materials urged the crowd dispersed, at the same time, various data feedback quickly back to the command center for the ground staff to cooperate to complete the scene control. If there is an abnormal fever, the next control plan will be triggered. The UAV will cooperate with the command center to obtain the data and information of the abnormal personnel, lock and locate the abnormal personnel, and prepare for further control and isolation.

Such a plan can closely combine the UAV, front-line staff and the backstage command center to quickly complete and respond to all kinds of unexpected work. Unmanned aerial vehicles (UAVs) enhance the combat effectiveness of the front limbs, and the back command center which has prepared various plans becomes the decision-making brain, and the front and back ends coordinate and form an efficient and scientific management system. All of this requires us to

establish a real-time and efficient communication command system based on various UAV application technologies; More importantly, scientific and flexible allocation of equipment, facilities and personnel, as well as logistics support work, coordination and cooperation between relevant departments need to have a scientific and systematic plan. The formation of these plans will also affect and innovate our existing work flow and work mode.

5. Strengthen the Construction of Basic Work and Establish a Long-term Mechanism

The application and safety control of UAV involves production license, quality inspection, radio supervision, airspace application, flight safety management, public security management and many other aspects. Responsibilities should be clearly divided and managed jointly by multiple departments. The safe use and reasonable control of UAVs can only be effectively achieved through multi-party cooperation and interaction. It will also implement a real-name system for drones and the construction of a monitoring platform. Peacetime also need to strengthen technical standards, management laws and regulations, safety publicity, rule of law and other aspects of work. We will strengthen team building, especially the training of technical personnel, do a good job in emergency drills, and improve the combat capability of our troops.[3]

With the rapid development of UNMANNED aerial vehicles (UAVs), the supervision of UAVs will be more and more heavy. Therefore, it is necessary to strengthen the infrastructure construction, configure UAVs supervision equipment, study the supervision system of UAVs, and establish a long-term supervision mechanism. In this way, drones can be better utilized in emergency response in emergency situations.

Acknowledgements

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