
Research on "Illegal Flying" of Civil UAV.

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Abstract

With the continuous maturity of UAV technology, UAV has been widely used in the civilian field, active in various fields and our daily life. However, behind this wide application, there are many hidden dangers and loopholes in the regulatory system, especially the illegal flying of civil UAV has seriously affected the public order and the safety of people's lives and property. Combined with the problems caused by the "illegal flying" of the civil UAV, this paper studies the causes of the "illegal flying" phenomenon, and puts forward the countermeasures of the "illegal flying" of the UAV, so as to better maintain the public safety.

Keywords

Civil UAV; Illegal Flying; Supervision.

1. introduction

Unmanned aerial vehicles(UAV) are aircraft that are not operated by the pilot on board, including remotely piloted aircraft, autonomous aircraft, and model aircraft. Remote control aircraft and the autonomous aircraft unified referred to as UAV. Among them, the remote control aircraft refers to the unmanned aircraft which has the flight function of height maintenance or position maintenance, and can intervene to control the flight at any time through the remote control station. Autonomous aircraft is a kind of UAV that can fly intelligently and autonomously throughout the whole process or can't intervene in the control of flight manually in a certain stage. UAV are divided into national UAV and civilian UAV. Civil UAV refers to UAV used in civil aviation activities; National UAV refers to UAV used outside civil aviation activities, including UAV used to carry out military, customs, police and other missions. UAV originated from the military UAV developed for military use in the 20th century, but with the continuous progress of UAV technology, the load and endurance capability of UAV is increasing, the maneuvering distance is increasing, and the flight altitude is getting higher and higher. Civil UAV facilitates the daily life of the public, and is widely used in such fields as aerial photography, geographic mapping, disaster rescue, pesticide spraying, express delivery and so on. However, the birth and development of every new science and technology is a double-edged sword, and UAV technology is no exception. UAV technology is also intentionally or unintentionally abused by operators, causing a lot of social problems, which is a huge hidden danger to public safety. At present, the phenomenon of "illegal flying" of UAV is the source of these problems. If we can reduce the "illegal flying" of UAV, we can make the UAV in a controllable state and reduce the security risks caused by UAV. As a result, the negative influence in the application of UAV is eliminated to a certain extent.

2. Problems Caused by "Illegal Flying" of Civil UAV

2.1 Identification Standard of "Illegal Flying" of UAV

Drones flying in the air also have to abide by certain UAV flight rules, otherwise they will face the suspicion of "illegal flying". According to the operational risk, civil UAV is divided into micro, light, small, medium and large. According to the relevant laws and regulations, the flight activities of drones

should meet several conditions: The first is to obtain the airworthiness license issued by the Civil Aviation Administration, the second is that the UAV operator has a pilot's license, and the third is to apply to the military and Civil Aviation Management Department for the flight area and plan, which can be approved before flying. Units and individuals purchasing civil drones shall pass real name certification and cooperate with the verification of relevant information.

If one of the above conditions is not met, it belongs to the "illegal flying" without flying qualification. However, micro UAVs fly outside the banned flight area and do not need to apply for a flight plan. Light UAVs and plant protection UAVs fly in the corresponding flying airspace, there is no need to apply for flight plan, but it is necessary to send dynamic information to the integrated supervision platform in real time. The situation of "illegal flying" has been banned repeatedly, which has undoubtedly brought difficulties to the air control of drones. At the same time, the risks caused by UAV "illegal flying" are gradually exposed, threatening flight safety and personal and property safety from time to time.

2.2 Problems Easily Caused by " Illegal Flyinging "

2.2.1 Disturbing the Order of Air Traffic

The influence of UAV "illegal flying" on air traffic safety is mainly reflected in two aspects. First, drones pose a great threat to the airport security order. From 2015 to 2018, there were more than 30 "illegal flyings" of UAVs in China. For example, on January 15, 2017, there was a UAV "illegal flying" incident at Hangzhou Xiaoshan Airport. The UAV has broken into the airport clearance protection zone, flying altitude is obviously within the aircraft take-off and landing altitude area, interfering with the normal flight of the aircraft, threatening flight safety. On May 1, 2018, four UAV interference incidents were detected at Kunming Changshui International Airport. The incident led to 28 flight delays at the airport, with flight delays of up to four hours and the closure of the airport runway for 45 minutes. In these incidents, drones interfere with the normal operation of the airport, resulting in significant economic losses. Second, the "illegal flying" of drones disrupts the order of air traffic. In the process of civil aviation flight, the emergence of unknown UAV will force civil aviation aircraft to change flight route temporarily, affect the normal flight of civil aviation, and lead to flight delay. In extreme cases, the collision between UAV and civil aircraft will cause greater loss of life and property. Secondly, the "illegal flyinging" UAV may interfere with the normal air training of the air force, occupy the combat readiness resources of the army, consume a lot of manpower and material resources, and bring serious real threats to the security of air defense.

2.2.2 Become a new Type of Criminal Tool

UAVs have a certain load-bearing capacity, JD Mall, SF Express and other companies have been actively promoting the industrialization of UAV freight transportation, at the same time, UAVSs also provide a new type of criminal channels for criminals. Nowadays, the situation of criminals using drones to carry out illegal activities such as drug transportation and smuggling is on the rise. In fact, drones are armed in the hands of terrorists. ISIS has used civil UAV to throw hand grenades from the air or to monitor coalition military operations in Iraq. In addition, ISIS has distributed videos online to encourage the use of drones to carry out terrorist attacks on a global scale, which is a major threat to national and social security.

2.2.3. Invasion of the Privacy of Citizens

UAVs have their own cameras, some small drones are light, and the sound is easy to ignore, creating conditions for individual to use tiny drones to spy on others. When flying a drone for peeping, even if the victim sees the drone flying in the sky, it is difficult to stop the behavior from continuing, and because of the nature of the separation of the operator from the drone, the operator can hide in a more difficult position to detect. In the end, the privacy of the victim is violated, but the criminals cannot be punished.

2.2.4. The Risk of UAV Falling from a High Altitude.

The "illegal flying" of civil drones may also affect the safety of people's lives and property. According to the "Interim Regulations on the Administration of Unmanned aerial vehicles (draft for comments)", the maximum take-off weight of light drones is no more than 7 kilograms, and the maximum take-off weight of small drones is as high as 25 kilograms. If the UAV user is inexperienced in controlling the UAV itself or the UAV fails in flight, a huge civilian UAV falls from tens of meters or even more than 100 meters in the air. Accidents that cause casualties and property losses are common. Some entertainment-oriented drone enthusiasts like to "illegal flying" in densely populated areas or key areas, and the danger of drones falling out of control can not be ignored.

3. The Causes of the "Illegal Flying" of Civil UAV

3.1 lack of Systematic Legal Support

UAV supervision involves more than 20 competent units, such as civil aviation, army, police, etc., the powers and responsibilities are not clear, coordination is difficult. Compared with the United States and the European Union, the UAV legislation in China is generally lack of top-level design, resulting in great differences in legislative ideas among various departments. With regard to the management of UAV, China has issued a series of laws and regulations such as "Measures for Air Traffic Management of Civil UAV", but the content is relatively general, the comprehensive view is relatively scattered, there is no complete system, lack of pertinence and constraint.

Although the local authorities have issued their own regulations and regulations, most of them are departmental regulations or normative documents, lack of sufficient legal effect, and there are problems of lagging provisions, narrow scope, unclear provisions, or even conflicts. The judgment of different courts on the "illegal flying" case is not consistent according to the applicable law, and the practicality is not strong. Generally speaking, China has not yet formed a perfect UAV laws and regulations and management document system.

3.2 Inadequate Supervision by Management Departments

The civil UAV itself has the dual attributes of ordinary commodities and aircraft, and the management work runs through the whole life cycle, such as development, sale, use, maintenance, scrapping and so on. As a result, the competent units involved are the Civil Aviation Administration, the Ministry of Industry and Information Technology, the General Administration for Industry and Commerce, the General Administration of Customs, the Ministry of Public Security, the General Administration of Sports, the military, and other organs and departments, and it is difficult to coordinate management work among various links. It is difficult to realize the orderly undertaking of the whole UAV life cycle, and there is no joint force among the regulatory departments. Secondly, for the punishment of "illegal flying", the responsibility and authority is unclear, the management unit lacks the enthusiasm to carry out the responsibility, can not put an end to the phenomenon of "illegal flying".

At present, the purchase channels of civil UAV are diversified, but there is a lack of a systematic management system, and the market supervision department can not effectively supervise the sales of UAV. In addition to the sale of common all-in-one civil UAVs on the market, there are also services for the sale and assembly of UAV parts. UAVs and aircraft models assembled by open source flight control are difficult to meet the requirements of current supervision, which is the gray area of supervision. Different from the products of regular manufacturers, the products assembled by scattered parts do not have electronic fences, can write track planning at will, the products are easy to modify, do not support real-time monitoring, flight performance is not constrained, there are greater safety risks.

There are also sellers driven by interests to crack the electronic fence, which has led to drone manufacturers from the source to control the "illegal flying" efforts have been greatly reduced.

At the same time, the legality and constraints of these behaviors are not in place. In order to improve the effectiveness of UAV supervision, we must speed up the improvement of laws and regulations,

strengthen the control of civil UAV components, and crack down on illegal cracking, illegal modification and other acts.

3.3 The Low Cost of "Illegal Flying" for UAV Operators.

3.3.1. UAV Flight is Difficult to Detect.

Unmanned aerial vehicle is a typical "low, slow and small" target because of its small size and weight. Some UAV can only show a dot by radar detection, and even some UAV body is made of polycarbonate material. Radar is more difficult to detect and track. The operator was lucky to think that his drone did not comply with the flight regulations and that it would be difficult for regulators to detect it, so they "took off" without relevant documents and approval, and drilled the regulatory loophole that the drone flight was difficult to detect.

3.3.2. Flight Approval is too Strict.

China's current UAV flight airspace is insufficient, the application process is complicated and difficult, when there is no land to fly, the application is difficult, there will inevitably be illegal flight. Another reason for the illegal flight of UAV enthusiasts is that the flight approval criteria are strict, and their skills are difficult to pass the examination, so they give up the approval and choose a simpler undocumented flight. The number of UAV enthusiasts is huge. If there is a consensus of luck among UAV enthusiasts, the phenomenon of "illegal flying" of UAV will be more difficult to control.

4. Suggestions for Ending " Illegal Flyinging "

4.1 Strengthening the System Construction of Civil Drones

4.1.1 Improving and Unifying UAV Legislation.

Since 2018, China has issued a number of laws and regulations on UAVs. Among them, "Interim Regulations on the Administration of Unmanned aerial vehicles (draft for comments) " is the first time to deploy the management and development of UAVs from the national strategic level. However, on the whole, the contents of these laws and regulations are relatively macro and general, and more detailed management regulations and implementation rules should be made for the production, sales and use of UAVs. Especially in the examination and approval process, China does not have too many regulations, there are relatively many blank points, we should perfect the examination and approval procedure through the law, make the examination and approval procedure more standardized and efficient. In addition, most of the laws applicable to civil UAVs by local governments in China are based on their own actual situation, such as regulations, documents, and so on, which lack the protection of superior laws, and the legislative standards of various localities are not unified. It is difficult to define the nature of the case and the extent of punishment in law enforcement. Therefore, the upper law should refer to the rules and documents issued by local governments, and make a detailed provision, so that the lower law can be found on the basis of law enforcement, local governments should integrate their own reality, and refer to the upper law to make more detailed provisions on some details.

4.1.2 Compulsory Insurance for UAVs.

UAV has been widely used in various industries and is still in the stage of rapid development. Once an accident occurs, it will cause huge economic losses to the user and the victim of UAV. Therefore, it is necessary to add compulsory insurance provisions for UAV and establish accident liability guarantee system to ensure the corresponding insurance after the accident. This requires a series of procedures such as the law to explicitly obtain a flight license, which is similar to buying insurance for cars, and there will be demand for drones when the UAV industry matures.

4.2 Strengthening Management.

4.2.1 Implement the Real Name System of UAV.

The real name system of UAV is the first step of UAV management. Any UAV management needs to start from this point. The implementation of real name system can make the follow-up supervision

and management work carried out in an orderly manner. The real name certification system of UAV and the affixing of QR code on the surface of the fuselage are only the most elementary means. The real-name system is not only to register the names of users, but also to truly identify and traceable drones in order to play the role of this system. First of all, manufacturers need to be required to mark the serial numbers of drones in an obvious position. And through technical means to ensure that it can not be altered, otherwise it will not be able to fly. Secondly, we should collect portrait information to avoid false real name registration. Finally, it is necessary to severely punish the illegal manufacturers and dealers who do not carry out the real name certification in order to implement the real name system and reduce the "illegal flying" from the root.

4.2.2 Overall Management Among Departments.

In recent years, with the explosive growth of civil UAVs, the existing flight supervision can not match the massive flight activities, and there is a lot of room for improvement both in the scope of supervision and experience. It is particularly important to coordinate the work between various departments, unite with various forces to manage as a whole, and improve work efficiency.

In the production and sales of UAV, the relevant departments should strengthen the supervision of open source flight control, set the necessary basic standards for the user DIY civil UAV and have the relevant departments to carry out compulsory certification. For the e-commerce sales of drones, it is necessary to obtain strict qualification certification, after the industry and commerce departments to meet the requirements of the industry before sales. In order to facilitate the management of UAV flight supervision, a special UAV Aviation Administration Committee should be established. This department is not essentially centralizing regulatory power, but only nominally centralizing it. Finally, the punishment for illegal acts should be implemented to the specific regulatory departments. Take the public security department as the main body to control the flight airspace and the traffic management department establishes air traffic rules. The technical supervision department unifies the signal management standards and rules of UAV, assists the public security organs to carry out the investigation and accountability after the accident. It should collaborate with civil aviation department, customs, security, and other forces to share information, make overall management, conduct preliminary qualitative analysis and law enforcement, and then submit the information to the public security department for punishment.

4.2.3 Simplify Flight Approval Procedures.

UAV operators think that the flight approval process is tedious, and the approval departments are too many to pass. They often choose the unqualified "illegal flying" in order to save time. The complex examination and approval departments should be integrated, and the examination and approval should be classified according to the purposes, so that operators can obtain different kinds of qualification. In order to improve the efficiency, we can open the network examination and approval process, online appointment examination and approval quota. Drone operators can also log on to the platform to query airspace usage and restrictions and submit flight applications online. All the examination and approval procedures are simplified, open and transparent, which saves the examination and approval time and enables more operators to patiently go through the examination and approval procedures, thus effectively reducing the situation of "illegal flying".

4.3 Technical Joint Defense.

4.3.1 Development of UAV Reaction Technology

With the explosive development of consumer UAVs, the threats posed by consumer UAVs are increasing day by day. In view of the increasingly severe threat of UAV, anti-UAV technology has become the focus of attention. Although the UAV technology has been updated and iterated many times, it has achieved certain results, but it is still in the initial stage of development. UAV counterattack is not only to drive away or shoot down UAV through technical means, but also to detect threat targets, which requires UAV countermanufacturer and UAV manufacturer to share part of the data coordination.

4.3.2 UAV Supervision Combined with Blockchain Technology

Block chain is the underlying technology of Bitcoin, which is a decentralized and trust distributed database. As one of the focus technologies at home and abroad, blockchain technology will have a broad space for development in UAV supervision. By using the irreversibility of blockchain technology, the information of UAV trading links such as manufacturers, sales networks and individual users can be recorded, so that each UAV has ownership. Moreover, this system is open. Through the blockchain, information is guaranteed to be unforgeable and non-tamperable for multi-party participation and supervision, providing a reliable legal basis for accountability and damage. Using the distributed network of blockchain technology, we can actively monitor the flight record of UAV and transfer the illegal flight behavior to the management of civil UAV.

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