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Research on Tort Liability Regulation of Unmanned Aerial Vehicle Logistics Distribution

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Abstract: *With the rapid development of unmanned aerial vehicle (UAV) technology, its application in logistics distribution is gradually rising, but the lag of the relevant legal system leads to many problems in tort liability determination, licensing system and regulatory mechanism. This paper analyzes the infringement problems in UAV logistics distribution, including the legal blank of tort liability identification, the unclear definition of the subject of liability and the unclear attribution of the type of infringement. At the current stage, the lack of a unified licensing system and regulatory mechanism for UAV logistics distribution leads to the uncoordinated and inefficient development of the industry. We can provide legal protection for the healthy development of UAV logistics distribution by building a unified industry standard system, strengthening supervision and management mechanism and improving relevant laws and regulations.*

Keywords: *UAV Logistics, Tort Liability, Legal Regulation, Licensing System*

1. Introduction

With the rapid development of electronics and navigation technology, China's UAV has been applied in various fields, such as power inspection, aerial photography, agricultural plant protection, aerial mapping, disaster relief and so on. In these areas, UAVs play a great role. For example, in the field of power inspection, installing infrared sensors and other components on UAVs can make them quickly find out the power problems, check whether there is leakage, power failure or poor contact of high-voltage lines, and then transmit the problems to maintenance personnel, so that they can accurately repair the power grid [1]. As a large agricultural country, UAV has been used in the field of agriculture for a long time, which can replace manual pesticide spraying and monitoring crop growth. The technology development of UAV in the above fields has been more comprehensive, but it needs further development and improvement in the logistics and transportation industry. Today, the delivery efficiency of logistics transportation cannot be met, and UAV logistics distribution has been favored by various logistics transportation companies. China's UAV logistics distribution service is still in the embryonic and small-scale trial operation stage, mainly led by the domestic logistics giants, and is gradually establishing an information-based, digital and intelligent innovative logistics distribution system, which also caters to the future market demand and conforms to the innovation trend of the logistics industry. However, there are still a lot of gaps in the legal system related to UAV logistics in China, and there is a serious lack of forward-looking legal thinking and unified standards. This has laid a lot of hidden dangers or restrictions for the development of UAV logistics, and the formulation of legal regulations and standards still needs to be constantly explored and summarized from practice, and the legal issues of UAV logistics distribution are studied. This paper focuses on the analysis of the current situation and existing problems of the legal regulation of UAV public safety, and puts forward suggestions on the legal regulation of UAV public safety legislation, supervision and legal rules for dealing with UAV safety accidents.

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2. Legal Problems in UAV Logistics Distribution

2.1 Infringement Liability Issue

UAVs are remotely controlled manually, but one of the problems of remote control is that the situation of the UAV itself is not easy to control, which may lead to the loss of power of the UAV, at which time the UAV may fall from the sky. On the one hand, it may injure people, on the other hand, it may hit other people's belongings [2]. When the UAV falls and injures others, because our country has not yet promulgated relevant laws and regulations for the UAV falls and injures people, it is impossible to find appropriate laws and regulations for the infringement in this case. In the aspect of infringement of UAV falling, there is a gap in our legislation from the establishment of infringement conditions to the determination of final tort liability. If an unmanned aerial vehicle (UAV) falls and causes injuries in the process of logistics distribution, whether the principle of fault or the principle of no-fault should be applied to the UAV operator, whether the type of infringement of UAV should be classified as highly dangerous liability or general tort liability, and whether the person responsible for compensation should only be identified as a logistics transportation company or should be extended to the producer of UAV, all of which need to be clarified by relevant laws. When the UAV falls in the process of logistics transportation, the fall may be caused by the natural conditions of the UAV itself (such as lightning, rainstorm, snowstorm, etc.), or by the improper operation of the operator, but no matter what kind of behavior, the UAV falls and causes personal injury or material damage.

2.2 Lack of Unified Licensing System

The use of UAVs in logistics transportation is related to public safety, so the access threshold of UAV logistics transportation should be unified. Unmanned aerial vehicle (UAV) logistics transportation is related to social public safety, and is also closely related to the personal safety and property safety of citizens, so a unified operation standard should be designated for UAV logistics transportation [3]. The Aviation Administration of China has issued a provisional regulation, namely the Provisional Regulations on the Management of Pilots of Civil Driving Aircraft Systems, which stipulates that the weight of UAVs is less than 7 kilograms, the flight range is within 500 meters of the location of the operator and the flight altitude is less than or equal to 120 meters, without the permission of the relevant departments. However, the use of UAVs outside this scope should be subject to a certain licensing system. This provision is mainly aimed at the private use of UAVs for photography, detection and other purposes, not the use of UAVs for logistics transportation mentioned in this article. There is only an abstract and general regulation on the specific licensing system for logistics transportation by UAVs beyond the above scope, and there is no uniform regulation on the weight of UAVs for logistics transportation, the types of goods carried, the flight route of UAVs, the flight altitude of UAVs, and the materials for the configuration of UAVs for logistics distribution. As a result, the development of UAV logistics transportation is not coordinated and efficient [4].

2.3 Lack of Unified Regulatory System

At present, some logistics and transportation companies use self-developed UAVs for logistics distribution, but such UAVs still need the permission of relevant departments in China to operate effectively. The premise of licensing is the existence of relevant regulatory authorities, but China has not yet set up a special department to supervise UAV logistics distribution. Firstly, because there is no relevant regulatory department, UAVs specially used for commercial purposes lack specific conditions for sale and use. Secondly, after UAVs are allowed to carry out logistics transportation, the operation process of UAVs also needs the supervision of relevant departments to prevent those with ulterior motives from endangering public safety or other people's personal safety and property safety in the name of applying for UAVs for logistics transportation. Thirdly, when UAVs cross two or more administrative regions for logistics transportation, how to divide the supervisory responsible persons and how to divide and cooperate the supervisory responsible persons in the process of cross-regional transportation need to be clarified. Fourthly, due to the lack of supervision system for UAV logistics transportation, UAVs may be forced to land due to public safety issues, or fail to operate smoothly due to the lack of orderly navigation system, which will undoubtedly greatly reduce the efficiency and quality of UAV logistics transportation, and cannot reflect the value of UAV logistics transportation.

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3. Identification of the Subject of Tort Liability for UAV Logistics Distribution

3.1 Basis for Determining the Subject of Tort Liability

With regard to the identification of the subject of liability for UAV logistics tort, some scholars have proposed that, in view of the realistic background of the separation of ownership and use rights of UAV, the principle of multiple liability subjects should be applied, the path of joint and several liability recovery for the owner of UAV and other related responsible persons should be established, and the responsibility of different liability subjects should be reasonably allocated based on different legal relationships. In this regard, in order to strengthen the response to the social reality of UAV logistics transportation, this paper recognizes that its tort liability should adopt the principle of multiple liability subjects to adapt to the special situation of man-machine separation in UAV logistics distribution.

The definition of the subject of liability for UAV logistics tort should mainly consider the two factors of benefit acquisition and risk control of UAV logistics distribution, on the one hand, it should trace the owner of the benefit of UAV logistics transportation, on the other hand, it should consider whether the actual controller and controller of UAV logistics distribution is the owner of UAV when the tort occurs. Based on the principle of consistency of rights and obligations, in order to balance the needs of protecting the interests of all parties, we should improve the identification rules of different types of tort liability subjects, clarify the tort liability subjects in the process of UAV logistics distribution and the rights and obligations between different liability subjects. When identifying the subject of tort liability in UAV logistics distribution, the owner of UAV is usually the subject of tort liability. In the special case of man-machine separation, based on the principle of self-responsibility, from the perspective of dualism of risk control and operational interests, the user of UAV should bear the damage consequences of UAV tort accidents. If the owner of the UAV fails to fulfill the duty of prudent care, which leads to the occurrence of the UAV infringement accident, the owner of the UAV should also bear the corresponding liability for the consequences of the damage.

3.2 Distribution Rules among Relevant Liability Subjects

Usually, the actual controller of UAV logistics distribution and the beneficiary of logistics distribution interests are the owner of UAV, and the owner of UAV should be the primary liability subject of tort. When multiple co-owners are involved, the co-owners should bear joint and several liability for compensation. When other subjects rent or lend UAVs for logistics distribution, the actual controller and owner of UAV logistics are not the same subject, if the owner of UAV logistics distribution has no fault in the occurrence of tort damage consequences, the lessee and borrower of UAV shall be liabilit y for compensation, if the owner of UAV logistics distribution has fault. It and the actual controller shall bear the corresponding liability for its fault. When employing others to operate UAVs for logistics distribution, the owner of UAVs is the actual recipient of the benefits of UAV operation, which should be included in the scope of employer liability in the Civil Code of China, and the owner of UAVs should bear the responsibility. In addition, when the UAV itself has defects that cause damage to logistics transportation products and damage to the third party's personal and property, we need to consider the issue of product liability, product designers, producers and sellers may be liable for the consequences of damage, if t he occurrence of infringement is caused by product defects, it is necessary to consider the issue of product liability. The producers and sellers of UAV logistics bear unreal joint and several liability, and the sellers have the right to recover their losses from the producers after bearing all the losses of the infringement victims.

4. Imputation Principle and Exemption of Tort Liability for UAV Logistics Distribution

4.1 Tort Liability Imputation Principle of UAV Logistics Distribution

The principle of liability fixation is the core issue of tort law regulation, which directly determines the constitution of tort liability, the allocation of burden of proof between the parties and the way of liability bearing. The tort liability part of the Civil Code of the People's Republic of China establishes the principle of liability fixation based on the principle of fault, supplemented by the principle of no-fault liability to regulate some special industries with high risk, which is also called strict liability or dangerous

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liability. It seems to be in line with the legal logic to invoke the general tort liability imputation principle to regulate the tort in the process of UAV logistics distribution, but it is unavoidable that the damage caused by UAV logistics distribution is complex and diverse, the relief of the general tort liability clause has functional limitations, and a single imputation principle is difficult to effectively realize the relief of the substantive rights and obligations of the victim of infringement. In this regard, it is necessary to carry out differential regulation.

When UAVs cause damage to the third party on the ground in the process of logistics transportation, we should distinguish two kinds of situations to discuss: one is the situation of causing damage to the third party on the ground, which should be applied to the principle of strict liability, that is, no-fault liability. The reason is that the high altitude operation of UAV is highly dangerous, once an accident occurs, it will cause huge damage consequences to the third party on the ground, from the perspective of protecting the weak group, reasonably sharing the tort losses, and urging the UAV logistics transport operators to improve their duty of safety care, regardless of the occurrence of damage. The principle of no-fault liability should be adopted to regulate the tortfeasor in order to avoid the occurrence of UAV infringement as far as possible. In the absence of corresponding legal norms, the provisions of the Civil Aviation Law on "liability of aircraft to third parties on the ground" and the principle of no-fault liability in Article 1238 of the Tort Liability Section of the Civil Code should be applied to this situation by analogy. Secondly, the principle of fault liability should be adopted for the infringement of other people's privacy in the process of UAV logistics transportation, where the fault behavior does not distinguish between subjective intent or negligence. The reason is that in the process of logistics transportation, the phenomenon of using UAVs to secretly photograph and record occurs frequently.In order to protect the privacy of citizens and severely crack down on the phenomenon of using UAVs to secretly photograph and transport goods, such acts must be strictly regulated in order to effectively protect the rights and interests of third parties. The principle of fault liability should be adopted for the damage liability of UAV and other aircraft in the process of UAV logistics transportation. Because the current legislation of our country does not have special legislative provisions in the field of UAV logistics transportation, based on the similarity of traffic accidents between such cases and motor vehicles, and the homogeneity and danger of UAV and other aircraft, the legal obligations are the same, we can refer to the Road Traffic Safety Law of our country and the Civil Law of our country. The principle of fault liability is adopted.

4.2 Infringement Exemption of UAV Logistics Distribution

As for the exemption of liability for damage caused by UAV logistics transportation, Article 1238 of the Civil Code limits the exemption of liability for damage caused by civil aircraft to the situation of the victim's intent, and there is no corresponding exemption norm for the situation of the victim's gross negligence, combining with the current widespread UAV tort accidents, in line with the principle of reasonable sharing. This paper recognizes the application of the fault offset rule to the situation where the third party has gross negligence, and orders both parties to bear their respective responsibilities within the scope of their responsibilities. In addition, as far as the exemption reasons other than subjective state are concerned, in the case that the third party's behavior directly causes the tort of UAV logistics transportation, there are doubts about whether it should be regarded as the exemption reasons in the academic circles, although our country has not yet set up the corresponding rules for dealing with the third party's behavior in the tort liability of UAV, but compared with the general tort. It is reasonable and necessary to expand the exemption of tort liability in UAV logistics transportation, which is beneficial to solve the complex problem of liability allocation in practice and provide multiple relief paths for the legitimate rights and interests of victims. In addition, combined with the relevant provisions of China's Product Quality Law, due to the limited level of science and technology, it is difficult to find the inherent defects in UAV logistics transportation, which can be used as one of the exemptions for infringement accidents in UAV logistics distribution.

The use of unmanned aerial vehicles for logistics transportation has great advantages, but the benefits and risks coexist. In order to reduce the economic burden of the infringer and protect the rights and interests of the victim, we must establish a reasonable responsibility risk sharing mechanism. Therefore, it is necessary and feasible to establish a compulsory insurance system for UAV logistics transportation. With the rapid expansion of UAV logistics and transportation market, civil UAV logistics and transportation has been integrated into social life, and the demand for UAV logistics insurance products has surged. At present, UAV insurance products in the market are all commercial products, but commercial insurance is voluntarily purchased by insurers, and its coverage and product types are narrow. It is not a reasonable and effective responsibility sharing mechanism, and it is difficult to meet the actual needs by setting up commercial insurance only. Therefore, it is necessary to establish a compulsory

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liability insurance system for UAV logistics and transportation, and give the victims of infringement the right to directly request the insurer for compensation, so that they can obtain the most basic economic and medical assistance measures. In addition to the establishment of third-party compulsory liability insurance, the liability risk can be shared through the establishment of UAV logistics distribution accident compensation fund, so as to form a diversified and simultaneous UAV logistics distribution tort liability sharing mechanism, so as to alleviate the dilemma of liability investigation after the occurrence of UAV logistics distribution tort accident, solve the problem that the infringer has no compensation ability when the infringement accident occurs in UAV logistics transportation, effectively make up for the lack of UAV tort liability legal norms, and ensure the rights and interests of victims to get full relief.

5. Analysis of the Legal Regulation Path of UAV Logistics Distribution

5.1 Improve Relevant Laws and Regulations

To formulate high-level laws or administrative regulations applicable throughout the country, and to refine the corresponding legal rules under the guidance of local or various departments. In the legal provisions, the first thing is to implement the tort liability of UAVs and establish a relief system based on the compensation of the carrier enterprises and backed by the state compensation. To clarify the legal responsibilities of producers, sellers and related parties. Revise the relevant rules and regulations on UAV operation in the Measures for the Administration of Express Business Licensing. The use of UAVs to maliciously disrupt aviation order or endanger public safety is incorporated into the criminal law in the form of the Criminal Law Amendment, and the serious malfeasance or illegal acts of relevant enterprises or regulatory bodies can also be punished, and the protection of the use of UAVs to maliciously infringe on the privacy of others is added to the administrative law or civil law. The operation of UAVs involves major issues of personal and property rights and interests, and the relevant legal amendments must be completed step by step after extensive public consultation. Secondly, the access license system of UAV should be constructed, and the basic information such as the scope, weight and mileage of the license operation should be clearly indicated in the license. The licensing system of UAVs can adopt the registration system plus the examination and approval system to regulate the market, and a series of procedures and standards for UAVs to enter the market should be clearly stipulated by law [5]. In terms of policy, we should advocate support and increase publicity, and gradually expand the market share of UAV logistics transportation. The revision of the Road Traffic Safety Law is a prerequisite for the large-scale operation of UAVs, and it is necessary to clarify the rules and regulations of UAV flight and the ownership of rights and responsibilities, so as to solve the problem of UAV flight right of way. It stipulates the skill requirements for UAV operators, who must pass the study and take part in the examination and regular study audit to obtain the corresponding qualifications.

5.2 Establish Industry Standard System

Building a unified UAV industry standard is an important cornerstone for the development of UAV. Considering that the main threat of large-scale application of UAVs is to endanger public safety and personal and property safety, it is necessary to solve or alleviate this problem from the root. In this regard, the author believes that the design standards of UAVs can be stipulated in the industry standards. Firstly, the outer layer of the UAV can be made of high-polymer carbon fiber soft material to minimize the mass of the UAV and mitigate the impact, while the color of the outer layer must be bright enough to attract attention. Secondly, the design of UAVs should be free of noise pollution, interference with wireless signals, interference with the transmission of radio stations and prying into other people's privacy and business secrets. UAVs can also be equipped with high-limit flight and automatic detection of flight conditions. Finally, the UAV must be designed to automatically open the parachute and alarm when it breaks down, so that at the first time of failure, the ground platform can send aircraft to rescue or be supported by the air monitoring machine. Automatic opening of the landing gear is an essential function, even if it is not found on the ground platform, it must be able to attract people's attention when it falls, which is also the basic industry standard for UAVs to be put into use. Industry standards for UAVs can be mandated by law, and penalties can be imposed on those who use deceptive means to meet or fail to meet the standards. Industry standards for UAVs should cover airline testing standards, product safety standards, information security standards and quality safety standards.

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5.3 Strengthen Supervision and Management Mechanism

As the supervision of UAVs involves the management authority of cross-departments such as transport routes, operation rules, system positioning, tracking supervision, emergency interception and search, it is necessary for multi-departments to work out the implementation rules of supervision and management, including market supervision mechanism and operation supervision mechanism. It is necessary to implement detailed provisions on the distribution of specific regulatory departments and regulatory bodies, as well as the assumption of powers, responsibilities, and obligations. The market access regulatory system can be used as a prior review to strictly control the quality standards of UAVs and to review the skills and qualifications of users. Market access audit standards for individuals and enterprises should be distinguished, for large-scale commercial use of batch UAVs must have a complete set of inspection and audit process to enter the market, and for individuals may need to have full civil capacity and hold corresponding skills certificates. This process may require the Quality Supervision Bureau and relevant professionals to audit in accordance with the standards. At the same time, laws or administrative regulations should authorize market supervision departments to have certain administrative penalty authority, of course, there must be responsibilities and to prevent abuse of power, so as to ensure the effectiveness of market supervision.

The main function of the operation supervision mechanism is to supervise after the admittance, and the operation supervision of the UAV is mainly to ensure that the weather conditions are suitable for flight, the normal conditions in all aspects before takeoff, the planned road conditions are good, and the ground positioning and tracking system is normal, and this work is a systematic and complicated project. It is necessary to establish a monitoring system similar to the current civil aircraft. The supervision of this process must grasp the flight dynamics of the UAV in real time, and send rescue aircraft on the ground or in the air to intercept it in case of emergency or crash, so as to avoid crashing on the ground. The supervision in the process of operation is of great importance, and the relevant legal liabilities for malfeasance must be strictly implemented and stipulated in accordance with the procedures. China's policy is to vigorously support the development of intelligent UAVs, as long as it has broad market prospects and can benefit the people, then the operation and supervision mechanism of UAVs will be gradually established under the leadership of the state.

6. Conclusion

The application of UAV in the logistics and transportation industry has great prospects for development, and the convenience, linearity and non-contact of UAV flight are more in line with the living habits of modern people. The application technology of UAVs in agricultural and military sectors has been developed perfectly, and UAVs for commercial use can learn from its model. Online shopping has become the first choice for most people, and the express industry should also improve efficiency to meet people's needs. Therefore, it is urgent for China to formulate a set of unified rules and regulatory system for UAV logistics transportation, so that the UAV logistics transportation industry can develop in an orderly manner. The legal regulation of UAV logistics distribution needs to be constantly improved in practice to serve the development of UAV logistics. As for the tort liability regulation of UAV logistics transportation industry, the fundamental method and way out lies in the improvement of legislation and the clarification of liability rules from the legislative level. In order to promote the orderly development of UAV logistics and transportation industry, building a reasonable and effective tort liability sharing mechanism should become an important issue to be solved. In order to effectively regulate the commercial practice of diversified logistics transportation, the existing legal norms must be reviewed and interpreted. Based on the lag of the law, the existing law cannot make a one-to-one corresponding adjustment to the complex social reality. In view of this, when facing the complex infringement problem of UAV logistics transportation, practitioners must comprehensively use various legal interpretation methods and consider the treatment effect of the case from the perspective of interest balance, so as to achieve a satisfactory solution to such disputes.

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