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Research on Civil Liability for Torts of Unmanned Logistics Vehicles

Yu Ze Yu, Liu Yu Tong, Qin Ran, Li Ruo Han, Luan Min Zhu

Faculty of Law, Beijing Wuzi University, Beijing, China

ABSTRACT

As the core technical carrier of intelligent logistics, the practical application of unmanned logistics vehicles improves transportation efficiency while triggering tort liability is-sues. This paper addresses these issues by focusing on the technical characteristics of unmanned logistics vehicles and the division of tort liability subjects. The current legal framework has de-ficiencies in aspects such as liability subjects, imputation principles, and exemption grounds, leading to problems in judicial practice such as unbalanced liability allocation and difficulties in determining causation. Through questionnaire surveys, on - site investigations, and other methods, based on the collected data, this paper proposes suggestions including establishing multi - party liability subjects and clarifying the legal status of unmanned logistics vehicles. It is hoped to provide assistance for the legal development of unmanned logistics vehicles, pro-mote the healthy and sustainable development of the intelligent logistics industry, and protect the legitimate rights and interests of both parties involved in liability.

KEYWORDS: *Unmanned Logistics Vehicles; Civil Tort Liability; Traffic Accident Liability; Exemption; Multi - party Liability Subjects.*

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INTRODUCTION

As part of autonomous driving technology, unmanned logistics vehicles have a promising prospect and are expected to be widely applied in the future. However, they are still in the experimental stage currently, and may face many tort liability problems when driving on real roads. Typical cases such as the 2018 Uber self - driving test vehicle accident that caused a pedestrian's death in the United States and the 2023 unmanned truck collision accident in a domestic logistics park have exposed core issues like vague identification of liability subjects, difficulties in determining causation, and unbalanced risk allocation. Therefore, there is great room for discussion regarding civil tort liability. Starting from the technical characteristics of unmanned logistics vehicles and existing le-gal provisions, and combining specific regulations and cases, the author analyzes the difficulties in determining the civil tort liability of unmanned logistics vehicles. From the perspectives of technical characteristics, legal framework, imputation principles, and liability subjects, and by referring to domestic and foreign legislative and judicial practices, this paper discusses the particularities of the civil tort liability of unmanned logistics vehicles and the paths to improve the relevant system, aiming to provide references for relevant laws.

1. Legal Positioning of Unmanned Logistics Vehicles

In recent years, with the rise of the "artificial intelligence + ex-press logistics" industry, unmanned logistics vehicles have become an emerging industry in the sector. They are intelligent vehicles with autonomous driving technology as the core, equipped with functions such as environmental perception, path planning, and re-mote communication, enabling automatic cargo transportation operations. However, due to the imperfection of relevant laws and regulations, problems such as difficulty in attributing torts, difficulty in dividing tort liability subjects, and unclear criteria for determining road rights and insurance liability still exist.

At this stage, unmanned logistics vehicles are still in the early stage of development, and most of them only operate in pilot areas. Therefore, the "Detailed

Rules for the Administration of Un-manned Delivery Vehicles" allows unmanned delivery vehicles to be managed with reference to non - motor vehicles in terms of road rights. However, the author believes that in the future development of unmanned logistics vehicles, they should be classified as motor vehicles. Traditional motor vehicles are driven or pulled by power devices, and unmanned logistics vehicles also rely on power for operation. They are also similar to traditional motor vehicles in terms of requirements for lighting, steering systems, and management modes, which to a certain extent meet the characteristics of motor vehicles. If they are classified as motor vehicles, their driving speed and cargo capacity will be further improved, which not only better conforms to their operating characteristics but also enhances the efficiency of logistics distribution in various regions. For traffic management departments, it will be easier to control traffic flow and optimize the overall transportation system. In the handling of accidents, motor vehicles have a complete compensation liability mechanism, which can protect the legitimate rights and interests of all parties more quickly and effectively.

Regarding the issue of road rights for unmanned logistics vehicles, the academic debate lies in the classification between motor vehicles and non - motor vehicles. The legal liabilities of the two are quite different: In terms of the imputation principle, the fault li-ability principle generally applies between motor vehicles, while between motor vehicles and non - motor vehicles, the no - fault li-ability principle usually applies to motor vehicles. In terms of the division of liability proportions, when motor vehicles bear equal li-ability, the liability ratio is often 50% for each party. When a motor vehicle and a non - motor vehicle are involved, if the motor vehicle is not at fault, it may bear a liability of no more than 10%; if the non - motor vehicle is mainly at fault, the liability of the motor vehicle can be reduced to about 30%. In terms of compensation, motor vehicles are mostly compensated first by compulsory traffic insurance, while non - motor vehicles generally do not have compulsory insurance. In addition, when a motor vehicle causes losses to a non - motor vehicle, the scope of compensation is more standardized, and the compensation capacity of non - motor vehicles is usually relatively weak.

Based on the "Road Traffic Safety Law", when unmanned logistics vehicles are at the L0 - L2 autonomous driving level, the driver is the main control subject of the vehicle, and the fault liability principle should be applied. If an accident occurs due to product defects of the vehicle, the vehicle manufacturer shall bear the no - fault liability. At present, most unmanned logistics vehicles that are in the pilot stage or have been put on the road are at the L3 level or above. At this level, the system transforms from an auxiliary nature to a decision - maker. Therefore, the author believes that after an accident occurs, the no - fault liability principle should be applied, and the vehicle owner or manager shall bear the corresponding liability. However, if there is evidence to prove that the accident was caused by a third party, the liability may be mitigated or exempted as appropriate.

2. Analysis of the Relationship between the Technical Characteristics of Unmanned Logistics Vehicles and the Attribution of Accident Liability

At present, unmanned logistics vehicles generally adopt L4 - level unmanned driving technology, which realizes a high - level of autonomous driving. That is, in specific environments and conditions, the vehicle can fully independently complete driving tasks and monitor the driving environment without the need for manual intervention by the driver. The new type of unmanned logistics vehicles is equipped with redundant sensor kits, which can accurately identify road vehicles and the surrounding environment, realize 360 - degree blind - spot - free precise perception of the entire vehicle, and provide stable unmanned delivery services. Its multiple safety protection mechanisms also provide effective support for the division of tort liability when accidents occur. However, due to the high degree of automation and data dependence of unmanned logistics vehicles, in their actual operation, problems such as the inability of humans to remotely monitor and conduct emergency intervention when the machine algorithm makes independent decisions, and data errors may occur, leading to accidents. Moreover, the adaptability of relevant norms for road rights management further increases the complexity of liability attribution.

For example, in October 2021, a collision accident between a Meituan unmanned delivery vehicle and a private car occurred in Shunyi District, Beijing. At the time of the accident, the unmanned vehicle was driving from west to east in the non - motor vehicle lane, while the private car drove out from a vertical direction and suddenly accelerated to turn right. The unmanned vehicle failed to stop after emergency braking, resulting in damage to the private car. From the perspective of road rights requirements, if the un-manned delivery vehicle had obtained road rights through the dual approval of the traffic management department and the government in accordance with

regulations, completed registration, obtained an exclusive license plate, and was equipped with an insurance mechanism, it would theoretically have the legal condition to be on the road. However, the core dispute of the accident is directly related to the classification of road rights: According to the requirement that ”unmanned logistics vehicles need to be classified into motor vehicles and non - motor vehicles according to their speed to specify the driving lane”, the traffic police finally classified it as a special tort motor vehicle traffic accident, determining that the accident was caused by the human fault of the private car driving out vertically and then suddenly accelerating to turn right, and had nothing to do with product algorithms. However, if Meituan had previously claimed that the vehicle was a non - motor vehicle and failed to configure insurance in accordance with the motor vehicle standards or follow the corresponding lane rules, it might have faced additional disputes in the liability determination. This exactly reflects the importance of ”clarifying the vehicle category to match the road rights”. If the category division is vague, it will directly affect the initial determination direction of accident liability.

Another example is the scratch accident between a Baidu un-manned logistics vehicle and an electric vehicle in Haidian District, Beijing on September 15, 2024: A Baidu unmanned logistics vehicle was driving at a low speed when it scratched an electric vehicle. The unmanned logistics vehicle did not stop immediately to wait for handling but continued to drive forward for 500 meters be-fore stopping by the roadside. Although Baidu responded that ”an agreement has been reached with the driver and there was no hit - and - run”, the accident was ultimately attributed to the algorithm problem of the unmanned logistics vehicle itself and needed to be classified as product liability. Regarding the above two cases, the author believes that: On the one hand, it is necessary to first check whether the unmanned logistics vehicle meets the basic road rights conditions. On the other hand, if the unmanned logistics vehicle did not stop immediately after the scratch in the accident, and if it was during the morning or evening peak hours, the ”peak - shifting driving” time period should also be considered. If the unmanned logistics vehicle did not reduce its use during the peak hours as re-quired, its legality of being on the road is questionable, which may increase the weight of liability determination. The requirements for road rights management such as ”vehicle registration, driving records, and supporting insurance” are not only prerequisites for the legal operation of vehicles on the road but also provide a basis for subsequent investigations.

It can be seen that the road rights norms for unmanned logistics vehicles are an important prerequisite for the attribution of accident liability. They not only directly affect the legality of vehicles on the road but also interfere with the definition of liability causes such as ”human fault” and ”product defects” after an accident, increasing the difficulty of liability attribution. Therefore, only by strictly abiding by the road rights management requirements can a solid foundation be laid for the clear division of accident liability.

3. Subjects of Tort Liability of Unmanned Logistics Vehicles and Liability Determination

Based on factual cases and their judgment results, the author analyzes the subjects that bear accident liability from the perspective of the division of manufacturers, sellers, users, and other relevant liability subjects.

1. **Manufacturers:** During the use of unmanned logistics vehicles, if personal injury or damage to others’ property is caused due to product quality problems of the unmanned logistics vehicles, in accordance with Article 41 of the ”Product Quality Law”, the manufacturer shall bear the compensation liability. After the victim undergoes an injury assessment by an injury identification institution to determine the injury level, in accordance with Article 44 of the ”Product Quality Law”, the manufacturer must compensate the victim for relevant medical expenses, repair costs of the damaged vehicle, etc. After the accident occurs, the program system should be tested to determine the tort act. If technical problems such as incorrect calculation logic, wrong identification of obstacles, improper planning of driving routes, or failure of the software to update road conditions in real - time are found, all of which violate the above-mentioned provisions, the software developer shall bear joint and several liability with the manufacturer. In this case, for accidents caused by quality problems of unmanned logistics vehicles, it is necessary to satisfy that ”the defect directly leads to the occurrence of the action result” so as to rule out the interference of other factors and avoid unclear division of liability subjects.
2. **Sellers:** (1) Before selling the product, the seller must strictly implement the incoming inspection and acceptance system to ensure that there are no ex - factory quality problems. If an accident occurs due to the seller’s failure to fulfill the inspection and acceptance responsibility, it is an act of dereliction of duty by the seller in

inspection and acceptance, which violates Article 33 of the "Product Quality Law". The seller shall bear the compensation liability, and there is a direct causal relationship between the dereliction of duty and the accident. If the seller has fulfilled the inspection and acceptance responsibility and can provide proof, it may not bear the liability. (2) If the seller sells the product with knowledge of its defects, leading to an accident, and maliciously sells unqualified products with obvious subjective fault, the victim may claim punitive damages in accordance with Article 47 of the "Tort Liability Law", and the seller shall be subject to increased compensation as a punishment.

3. **Users:** (1) The user shall conduct regular vehicle inspections and maintenance on the unmanned logistics vehicle. If an accident occurs due to vehicle damage caused by exceeding the vehicle in spection period or failing to conduct regular maintenance, which violates the requirements of the "Road Traffic Safety Law" regarding whether the vehicle meets the safety technical standards, the user shall bear the compensation liability. (2) The user shall not modify the unmanned logistics vehicle without permission; other-wise, the user shall bear the responsibility for any accidents caused thereby. (3) If an accident occurs or is aggravated due to the dereliction of duty of the supervision personnel assigned during the operation of the vehicle on the road, which violates the corresponding management obligations, the supervision personnel shall bear the compensation liability. The user's violation of regulations may cause personal and property losses to the victim, and in more serious cases, the user may be subject to administrative penalties for illegal operation. In the above situations, it is necessary to prove that the improper management and the act directly led to the occurrence of the accident, and rule out the impact of extreme weather.

4. **Other Relevant Liability Subjects:** (1) Traffic Department: If the signal lights in the driving area are unreasonably set or fail to be repaired in a timely manner when a fault occurs, the traffic department shall bear supplementary liability. (2) Third - party Providers: For example, if an accident is caused by information ex-change problems such as network interruption or delay resulting in data transmission interruption, which directly leads to the occurrence of the accident and causes personal and property losses to the victim, the Internet service provider shall bear the liability; if an accident is caused by a pedestrian or another vehicle violating traffic rules, which is caused by both the pedestrian and the unmanned logistics vehicle, damaging the personal and property safety of both parties, the pedestrian and the unmanned logistics vehicle shall bear joint liability, etc.

5. **Special Cases:** (1) If it is impossible to determine the main responsible party for the liability, the dispute may be resolved through multi - party negotiation, or the compensation may be shared in accordance with Article 24 of the "Tort Liability Law", and the damage to the victim shall be borne jointly by multiple parties. (2) For accidents caused by force majeure such as sudden extreme weather and earthquakes, where there is no specific tort act and only the occurrence of damage results, in accordance with Article 832 of the "Civil Code", no liability shall be borne.

In the Meituan unmanned delivery vehicle accident, after the traffic accident occurred, the traffic police classified the vehicle as a motor vehicle, but Meituan believed that the unmanned vehicle was a non - motor vehicle and therefore did not purchase compulsory traffic insurance for this unmanned logistics vehicle. According to Article 76 of the "Road Traffic Safety Law", compulsory traffic insurance is a statutory compulsory insurance, and vehicles without insurance shall bear the losses themselves. In addition, the burden of proof in this incident lies with Meituan. If Meituan cannot prove that the vehicle has no technical defects, Meituan shall bear all the losses. Secondly, the existing product defect standards cannot be fully applied to unmanned logistics vehicles, so the issue of compulsory traffic insurance for unmanned logistics enterprises needs to be resolved. Although Baidu's unmanned logistics vehicles have purchased compulsory traffic insurance and commercial insurance, the "hit - and - run" behavior after the accident may trigger the insurance exemption clause. According to Article 17 of the "Insurance Law", the insurance company shall perform the "reminder + clear explanation" obligation for the exemption clause; otherwise, the clause shall be invalid. In addition, Baidu's insurance cover-age does not include the risk of technical defects. If the accident is ultimately caused by an algorithm problem, the insurance company may refuse to compensate. The author believes that we can learn from the compulsory insurance model for unmanned logistics vehicles in foreign countries, such as the "UBI" insurance model, where the insured can purchase insurance based on the number of insurance claims and other dimensions based on that. Secondly, ac-cording to the "Regulations on Autonomous

Driving Vehicles" and the "Implementation Rules" officially issued in Beijing on April 1, 2025, the test subject of autonomous driving vehicles shall purchase traffic accident liability insurance of not less than 5 million yuan per vehicle or provide a compensation guarantee of not less than 5 million yuan, which also applies to unmanned logistics vehicles. To sum up, legislators should require operators of unmanned logistics vehicles to purchase compulsory autonomous driving insurance in the road traffic safety law to protect the rights and interests of victims, minimize commercial losses, and maintain the corporate reputation.

4. Exemption Disputes in Unmanned Logistics Vehicle Delivery Disputes and Protection of Users' Rights and Interests

In addition to traffic accidents, unmanned logistics vehicles may also cause disputes due to cargo loss or delay during the delivery service. The focus of exemption disputes in such logistics service performance cases is significantly different from that in traffic accidents:

In May 2023, a user of Southwest Medical University reserved an unmanned logistics vehicle to pick up a package. The user failed to pick up the package on time due to a temporary matter. According to the rules, the package should have been returned to the Cainiao Station. However, the user failed to find the package after going to the station to pick it up for many times. The user complained to the customer service and sought compensation. Finally, Cainiao only compensated 14 yuan on the ground that "the package was not picked up within the specified time". Cainiao cited the clause in the "Service Agreement" that "the platform shall not bear full compensation liability for package loss caused by failure to pick up the package within the time limit" and attributed the liability to the user's personal reasons.

In March 2025, during the delivery of an unmanned vehicle of a logistics enterprise in Xi'an, the original route was closed due to road construction. The enterprise automatically planned an alternative route. However, during the alternative route, due to road con-gestion and identification deviation, the cargo was finally delayed. After the incident, the enterprise provided the customer with the relevant announcement issued locally and the congestion certificate at that time, claiming exemption from compensation liability due to force majeure and third - party liability. After negotiation, the customer accepted the enterprise's exemption statement and did not file a further claim.

China should establish a multi - party collaborative accident handling system for unmanned logistics vehicles and ensure that the li-ability subject can be quickly determined after an accident through a special accident handling platform to avoid liability shirking. The author believes that the following common situations can apply the exemption clause:

1. **Force Majeure:** If natural disasters such as earthquakes, floods, and mudslides or other objective situations that cannot be fore-seen, avoided, or overcome are encountered during transportation, no civil liability shall be borne in accordance with Article 180 of the "Civil Code".
2. **Third - party Causes:** If the accident is caused by malicious damage by a third party, the owner or manager of the unmanned logistics vehicle shall be exempted from or have their liability reduced according to the actual situation, and may claim compensation from the third party if they can prove that they have no fault.
3. **Compliance with Traffic Rules and No Fault:** When an un-manned logistics vehicle strictly complies with traffic rules and has no fault in the accident, the exemption clause can be applied.

5. Suggestions and Prospects for the Future Development of Un-manned Logistics Vehicles

The author puts forward feasible suggestions to solve the many challenges faced by unmanned logistics vehicles in terms of technology, regulations, and market, so as to promote their large - scale market launch and achieve sustainable development.

1. **Establish a Multi - party Imputation System:** For a series of liability subjects ranging from vehicle manufacturers to sellers and then to users, improve the current situation of vague liability de-termination, and clarify the legal liabilities that each party should bear, such as fault liability, no - fault liability, and presumption of fault liability.
2. **Clarify the Legal Status of Unmanned Logistics Vehicles**, and conduct comprehensive and multi - dimensional simulations of complex road conditions and emergency situations during the road test phase to ensure that correct responses can be made in a timely manner when facing practical problems, and minimize economic losses while giving priority to ensuring life safety.
3. **Establish Cooperation with Insurance Companies to protect the legitimate rights and interests of both victims and un-manned logistics vehicles.** Set up a compensation fund to compensate the victims immediately when a tort occurs, minimize losses, and maintain the public

image and reputation of unmanned logistics vehicles.

4. **Compulsorily Require the Preservation of Driving Records from the Driving Recorder**, and prohibit unauthorized deletion or tampering to evade legal liability. Establish a data protection system to improve the transparency of operation.

5. **The Government Should Issue Relevant Laws and Regulations to accelerate the R & D process of enterprises and help the large - scale development of the unmanned logistics vehicle industry.** The exemption disputes of unmanned logistics vehicles need to be solved through the collaboration of law, technology, insurance, and society. By improving regulations, optimizing technology, strengthening insurance, and establishing a transparent accident handling mechanism, disputes can be reduced and the healthy development of the industry can be promoted. In the future, with the maturity of technology and the improvement of supervision, the liability determination of unmanned delivery vehicles will become clearer, and the public acceptance will gradually increase. In the future, the relevant laws and regulations on unmanned logistics vehicles will become clearer and more in line with the actual situation. For example, whether the vehicle's control system makes decisions independently or is remotely controlled by hu-mans; whether the person responsible for monitoring the vehicle has fulfilled their responsibilities and kept a close eye on the vehicle's status at all times; and what the technical condition of the vehicle itself is, and whether the accident was caused by equipment failure.

At the same time, the entire legal and regulatory system will be gradually improved. Every link of unmanned logistics vehicles, from the quality indicators in the production and manufacturing link to the routes planned and rules formulated during actual operation, and then to daily management and maintenance, will be restricted by corresponding legal provisions, ensuring that the entire industry operates in accordance with rules.

The current insurance cannot fully cover the special situations of unmanned logistics vehicles. In the future, special insurance products will be designed for them. For example, reasonable insurance premiums and claims rules will be formulated based on various factors such as vehicle type, transportation environment, and autonomous driving technology level, so that even if problems occur, there will be more suitable insurance to share the risks.

In addition, with the development of unmanned logistics vehicles, cross - border delivery may be involved, so the cooperation and coordination between countries should be strengthened. Countries along the transportation routes can discuss relatively unified super-vision standards to avoid troubles caused by different laws in different countries, allowing unmanned logistics vehicles to develop more extensively globally and promoting the healthy progress of the entire industry.

6. Conclusion

The determination of tort liability for unmanned logistics vehicles is a legal issue involving multiple legal subjects. China should establish an imputation system with logistics operators as the main liability subjects and manufacturers as the secondary liability sub-jects, while considering the liability factors of third - party social subjects. From the perspective of current legal norms, accidents caused by technical defects are mostly borne by operators, product defects are traced back to manufacturers, and damages caused by intentional or negligent human factors apply the fault liability principle. In terms of the insurance system, China should construct a targeted insurance system adapted to the characteristics of un manned technology, and include new risks such as algorithm errors and system failures into the insurance coverage. At present, some pilot cities in China have issued local regulations, but the country has not yet formed a unified legal system. In the future, it is necessary to seek a balance between legal liability in the fields of technological innovation and public safety, and provide legal guarantees for the standardized operation of unmanned logistics vehicles through multiple measures such as improving legislation, perfecting the insurance system, and upgrading technology.

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