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# Study on the Countermeasures of Preventing and Controlling Terrorist Attacks in the Urban Rail Transit

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**Abstract:** In recent years, there have been frequent terrorist attacks on urban rail transit systems around the world, which have exposed loopholes in such measures as security inspection and prevention. The urban rail transit system is easily targeted due to its relative openness, unthoroughness of security inspection and seriousness of the damage consequences. It is also a risk zone of non-traditional security and a perfect place for terrorists to create indiscriminate killing cases. Based on field research and combining with the practical problems of rail transit at home and abroad, this paper analyzes the terrorist risks such as in urban rail transit platforms, surrounding areas and stations, and puts forward the mechanism construction and security technology prevention system of perfecting the urban rail transit operation department and related early warning countermeasures. At the same time, by exploring ways to prevent and control terrorist attacks, and improving the sensitivity and effectiveness of prevention and control, this study has certain reference significance for guiding China in the fight against terrorism in cities.

**Keywords:** Urban Rail Transits, Loopholes of Safety Prevention, Security Inspection Measures, Terrorist Attack

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## 1. Introduction

At present, the rail transit is one of the major public transport vehicles in cities. It has the advantages of high speed, safety, punctuality, large passenger capacity and low pollution, which became the first choice for most passengers under the background of urban road congestion. However, there are also certain weaknesses. There are a large number of passengers in the confined underground space at the same time. It hides a huge security crisis because of the dense population, inconvenient access, limited ventilation, and relative difficulty in escaping. From the perspective of the global terrorist attacks in recent years, the urban rail transit hub has become an important target for terrorists. The reason why terrorists took the urban rail transit system as the target was because it could create not only major casualties, but also “theater effects”, which create far more profound harm to the public’s psychology and social order. [1] Under such a background, the risk of terrorist attacks will be greatly increased if the prevention and control measures of rail

transit are full of loopholes. Based on the characteristics of the urban rail transit, this article puts forward the countermeasures for preventing and controlling terrorist attacks on the rail transit from the perspective of improving the security prevention and control measures.

## 2. Risk Assessment of Terrorist Attacks in the Urban Rail Transit

According to relevant statistics, 26% of the terrorist attacks in the whole world occurred on the rail transit. The rail transit has the characteristics of long transportation line, wide coverage, multiple stations, and large passenger flow. In the past two decades, the number of terrorist attacks in the urban rail transit system has been on the rise, [2] and the counter-terrorism situation has become increasingly severe. There were dozens of terrorist attacks on urban rail transits around the world. The common feature was that the urban rail transits were the target of attacks, and there were also some common elements in the details of terrorist attacks. For

instance, "April 10th" subway arson case in Chengdu and "February 10th" arson case in Hong Kong have sounded the alarm for us. In "July 7th" case in the United Kingdom, terrorists used explosive attacks to cause multiple deaths and injuries. In particular, during sensitive periods such as important conferences and essential events, it is also a high time of terrorist attacks. On March 29, 2010, a series of bombings occurred on the Moscow subway. The crime tactics were similar to the "July 7th" case in London. Both of the two attacks used suicide bombings to detonate explosives in the compartments to create indiscriminate killings and injuries. In these two cases, the rail transit security measures became a pseudo-risk segregation zone, allowing violent terrorists easily bring explosives into the subway compartments. In addition, structural designs, management systems and other aspects are also flawed. Facts have proved that there is still room for improvement in the ability of various countries to prevent and control terrorist explosions in urban rail transit hubs. In the past 10 years, the rail transits accounted for about 30% of the targets of terrorist attacks, and the number of casualties caused by terrorist attacks in rail traffic accounted for nearly 50% of the total number of casualties in all terrorist attacks. However, the anti-terrorist construction plan of the rail transits, which should be synchronized with the general plan of rail transit constructions, is far behind. [2] In particular, loopholes in security inspection and control measures increase the risk of terrorist attacks on rail transit systems.

### ***2.1. Difficulties in Scanning all Passengers in Safety Inspections***

Openness, mobility and rapidity are the essential characteristics of the rail transit, making the areas radiated by the rail transit become the most frequent places for crowds in cities. The rail transit has taken on major passenger transportation tasks in urban traffic in many countries, such as New York, Berlin, Moscow and other cities, and its rail transportation has accounted for more than 40% of the total passenger traffic in the entire city. [3] Due to the huge daily passenger flow, coupled with the characteristics of long lines, multiple stations, and fast passenger flow, it is determined that rail transit operators and the police cannot scan all passengers in the same way as airport security inspections. Therefore, all kinds of extremists and terrorists can easily infiltrate the rail transit system to launch terrorist attacks, which is the main reason for the frequency of rail transit terrorist incidents around the world in recent years. [4]

### ***2.2. Difficulties in Safety Precautions of the Rail Transit Operation***

The terrorist attack is actually a "rational" selection process, which is the result of comprehensive consideration of the vulnerability of the target and the expected loss of the attack. The level of casualties, social panic, and media attention caused by terrorist attacks are the main elements in selecting targets for attacks. [1] Urban rail transit routes run

through the entire city, such as government buildings, financial institutions, transportation hubs and residential areas, connecting a city's political regions, economic regions, cultural regions, and living areas. It is easy to form dead corners and blind spots of security prevention and become important targets for terrorists due to the large passenger flows, long lines, multiple sites and high cost of security prevention, especially the low density of patrols in the rail transit. Taking Chongqing rail transits as an example, the number of passengers reached 693 million in 2016, and the daily passenger volume reached 2.036 million, and the maximum daily passenger volume was 2.6182 million. The rail transit is a relatively closed special track and the underground ventilation system in this track is rather fragile, it is easy for terrorists to target. However, due to the rapid increase of rail transit lines, the risk situation is becoming more and more complicated, in turn, the safety prevention and control measures cannot adapt to the development speed of the rail transit and the mode of police prevention and control management has taken a heavy toll on the public security work, such as the construction of public security prevention and the controlling network and so on. [5]

### ***2.3. High Safety Requirements in the Rail Transport Operation***

The urban rail transit is a relatively independent closed high-speed operation system, which constitutes the survival chain of the rail transit. However, the corresponding equipments such as the control room, the power supply room, etc. are separated at different places, even away from rail transit stations. Its ventilation, lighting, operation, etc., need to be guaranteed by power systems through the special equipment and all the vital factors are closely linked together. Once a terrorist attack such as an explosion occurs, it will not only cause direct injuries, but also various kinds of injuries or accidents in the flustered escape, which easily cause a wider range of secondary disasters such as the interruption of water and electricity supply, leakage of electricity, flood flooding, etc., leading the disastrous consequences of the paralysis of the whole city. [3]

### ***2.4. Imperfections in the Safety Prevention System***

At present, some urban rail transits are only equipped with some basic safety facilities and equipment, such as fire-fighting equipment, flood prevention equipment, alarm equipment, and rescue equipment. It is equipped with the smoke alarm devices in the train compartments, while no chemical sensor to detect poison gas. That is to say, it is difficult for the smoke alarm device to effectively detect when a colorless poisonous gas permeates the carriage. In terms of safety inspections, the management agency of rail transits mainly focuses on the security precautions against controlled knives, inflammable and explosive materials, etc. Although there are X-ray machines and scanners for detecting personal items, there are no instruments for anti-terrorist and anti-riot detecting. There is also no independent counter-terrorist emergency command system and

its related supporting facilities. At the same time, the results of the lack of unified emergency communication systems will be that it cannot be sure that the commander of the Public Security Bureau can effectively command every police officer after a terrorist attack. In addition, there are some problems in the video surveillance system of the urban rail transit, such as the range of video capture is not fully covered, the video storage technology cannot break through the bottleneck.

### 3. Analysis on the Risk Areas of the Urban Rail Transit

The main risk areas of the urban rail transit are stations, surrounding areas of the stations, and transfer vehicles between the different important stations.

#### 3.1. Risks in Stations

Platforms are the areas that people must pass through when entering and leaving rail transit cars, undertaking the function of the personnel interaction and diversion. Platforms are also the areas with the most stringent safety inspections because of the high density and mobility of personnel. At present, station platforms are equipped with prevention measures such as "human defense, material defense, and technical defense", such as entry and exit security inspections, video surveillance, and mobile personnel inspections, which is a combination of fixed defense and mobile defense. However, according to actual investigations, there are still many loopholes in the current platform safety inspections. [6]

##### 3.1.1. The Equipment of the Inspection Is Not Advanced Enough

It is hard to detect all dangerous goods, such as occasional checking failures cannot be avoided because of the limited sensitivity of the device.

##### 3.1.2. There Are Omissions in the Inspection of Carry-on Baggage

It is difficult to achieve the goal of conducting security checks on every passenger and their luggage in the peak period, even though there are many modes of security screening, such as Beijing-style "every package must be checked, every liquid must be checked" or Shanghai-style "Large package must be checked, small packet should have a sport check". [3] It is inevitable that the phenomenon of missing inspection would occur from time to time because of the professional level of security inspection companies and their security personnel are not good enough, and the safety awareness and sense of responsibility of some security personnel are also not strong enough.

##### 3.1.3. Limited Patrol Strength in the Station

The patrol inspection is a complement to the failure of the fixed security inspection and a very important countermeasure. It has the duty of deterring and attacking those who attempt to commit crimes. Professional patrol inspections are a great deterrent for premeditated terrorist assailants. At present, there

is a lack of professional patrol inspection power in the platforms, especially the lack of identification skills for the type of explosive device, the appearance of packaging, the method of carrying, and lack of pre-disposal methods for explosive devices.

#### 3.1.4. The Intelligent Degree of Video Surveillance System Needs to Be Improved

The existing station video surveillance only has the functions of playback analysis and image evidence data collection, but has no the functions of face recognition and early warning, which is difficult to meet the requirements of terrorist attack prevention.

#### 3.2. Risks in Peripheral Areas

##### 3.2.1. Peripheral Areas of Stations

It is difficult for violent terrorists to enter the platform areas through multi-layer defense, so they may have to take the second best, such as take a Jihad locally or carry out attacks on the area with relatively dense crowd around the station. For terrorist attackers, creating panic and casualty expectations are the focus of their planning actions. Therefore, the surrounding areas of the platform are the targets of the selected attack risk. In summary, it is necessary to incorporate the surrounding key areas into the scope of safety protection of the rail transit system in accordance with the concept of regional coordination to enhance the effectiveness of prevention and control.

##### 3.2.2. Transfer Vehicles Between the Different Important Stations

From the "July 7th" bombings in London, buses and other vehicles connected to different important stations may be the attack points for terrorist attacks. Attacks on these vehicles are echoed by the attacks on rail transit sites, creating major social panic.

#### 3.3. Loopholes in Station Prevention and Control

##### 3.3.1. Identity Information of Passengers Cannot Be Determined

In general, passengers get into the station through brushing bus cards only with the carried items need to be security inspected. However, there is no a real-name registration during the process of handling the bus card. The cardholder can enter the station with a borrowed bus card or even a picked bus card, or purchase a one-time bus card temporarily. We cannot shut the terrorists out of the station or take control measures to prevent terrorist attacks because we can't identify the identity information of passengers in time, and it is difficult to find out focused people and extremists in advance.

##### 3.3.2. Inadequate Police Strength and Insufficient Security Equipment

At present, only the rail public security organs in Beijing and Shanghai have basically achieved the "one station, one police" police force allocation required by the Ministry of Public Security. In the face of the rapid development of the rail transit, the police

force in most other cities cannot meet the requirements, and the security prevention and control force is seriously insufficient. In addition, equipment such as anti-riot steel forks, retractable batons, and riot spray are usually placed separately and are not in the vicinity of security inspectors. In the event of a violent terrorist attack, it takes a certain amount of time to pick up equipment and it is difficult to form an effective combat unit to control the attackers in the first place.

### ***3.3.3. The Facilities of Security Inspection Are Not up to Standard***

There are X-ray detector and liquid safety inspection instruments for rail transit security inspection, but there are no metal detection doors and corresponding personal inspection measures. In recent years, terrorist attacks have taken the form of migratory jihad, local jihad and so on. No matter what kind of terrorist attacks, if any violent terrorists attempt to commit terrorist attacks, they can avoid safety inspection to enter the platform simply by carrying explosives, toxic gases, knives, axes, guns and other crime tools on their bodies. In the event of a terrorist incident, the safety of the passengers will not be guaranteed, even there will be stampede accidents in panic because of the narrow confinement of the carriages and the limited space on the platforms. Security measures at this stage have objectively provided opportunities for violent terrorists and extremists to commit crimes.

## **4. Countermeasures for Preventing and Controlling Terrorist Attacks in the Urban Rail Transit**

Since there are so many risk factors hidden in the rail transit, then why has not been resolved? There are the following practical dilemmas: First, the huge passenger flow. If an overly complicated security inspection system is adopted, it may lead to inconvenience for passengers and difficulties for train operations; Second, the insufficient fund. Perfecting the security inspection system requires the upgrading and replacement of it, which involves a large amount of expenditure; Third, imperfections in legal systems. Laws and regulations do not clearly stipulate the related matters about the passenger transportation, such as the handling of passenger cards. In short, objectively, there are many hidden dangers in the security inspection and prevention of the rail transit. But how to improve the efficiency of security inspection and solve the security problems? In order to solve problems effectively, we can look for countermeasures from the following aspects.

### ***4.1. Perfecting the Mechanism Construction of the Urban Rail Transit Operation Departments***

#### ***4.1.1. The Real-Name System of Public Transportation Cards Should Be Implemented and the ID Card Should Be Required Shown When Purchasing Tickets***

The ticket system of public transportation cards should access to the public security management information

network. Passengers should be required to input their personal identity information when they apply for a public transportation card, and should also identify the identity information first even when buying a one-time ticket. In this way, the travel trajectory of suspicious and focused persons can be mastered.

### ***4.1.2. Professional and Specialized Training for Security Inspectors Should Be Strengthened***

It is necessary to strengthen the quality of security personnel to take the road of professionalization and specialization. The security inspectors should pass the certification exams before obtaining professional qualifications. Rail companies should conduct regular professional training for security inspectors, strengthen the training of anti-terrorism knowledge and on-site disposal ability, enhance their ability to identify suspicious individuals and dangerous goods, raise their tactical qualities and make them have good disposal skills and adaptability and improve the equipment configuration of security personnel to ensure that everyone has anti-riot equipment and be able to form a minimum combat unit for disposal at critical times. In addition, it is necessary to ensure that the security inspectors can make direct contact with the public security organ, and can quickly feed the information back to the public security organs in the event of an emergency, so as to get the quick support and effective disposal of the police force. [7]

### ***4.1.3. Extending the Process of the Security Inspection***

From the view of the theory of "urban ecology", the rail transit system, as an important urban public transportation hub, is essentially a transit channel connecting important buildings and places in cities. Therefore, from the standpoint of the three-dimensional defense against terrorism, the surveillance of suspicious individuals, the detection and inspection of explosives, and the technical prevention of premeditated terrorist bombings should not be confined to the "subway station" itself, but need to be reasonably extended. [1] Extending security inspection process is to take a series of measures to prolong the security process and route in response to the geographical environment and surrounding conditions of the rail transit stations. Some urban rail transit stations are located underground, some are set above the ground, and some are located in large shopping malls. Passengers need to take an escalator or walk along the staircase for a long distance to enter the station. The current security checkpoints are all located at the entrance of the station. Passengers are not subject to security checks before entering the station. If suspicious persons or dangerous goods are found, the disposal inside the station will also cause great losses or casualties. Cooperating with intelligent face recognition systems, suspicious persons carrying contraband items will be effectively intercepted if we set up the security inspection measures in advance, install security inspection equipment on both sides or in front of the stairs and elevators to separate passengers and carrying items. This method can not only will not extend the time of passengers

entering the station, but also carry out the simultaneous inspection of passengers and carrying items.

#### **4.1.4. Improving the Design of Subway Emergency Structures**

The upgrading of the structural design includes not only the addition of emergency evacuation routes and emergency exits, but also sufficient emergency lighting, safe evacuation signs, and shielding devices for fire prevention and antivirus at the time of the incident. [8]

#### **4.2. Perfecting the Safety Technology Prevention System and the Early Warning System**

According to the analysis of the data collected from terrorist attacks on the rail transit, terrorists often use explosions as the way of attacking rail. Some of the explosives they used are difficult to detect with ordinary detectors, such as plastic explosives can be disguised as daily supplies and hidden in luggage. They are difficult to identify in appearance, but extremely powerful. For example, there have been many terrorist attacks against rail traffic successively in Russia, the United Kingdom, Belarus, Chile, France, Spain and other countries, resulting in massive casualties and property losses. [9]

##### **4.2.1. Addition of Security Check Dogs**

The police dog has a sensitive sense of smell and quick response. It has a powerful recognition ability for sensitive items and can go to narrow areas and dangerous areas that people cannot reach. The police dog detection can play a good role in the relatively limited space of the rail transit in urban cities. For example, it is useful for Paris subway systems to detect with police dogs. [10] The addition of sniffer dogs can not only enhance the ability to identify drugs, gas and explosives, but also increase the deterrent force of law enforcement, making security inspectors be more professional and authoritative in the minds of the masses. [11]

##### **4.2.2. Security Shields Should Be Built to Against Terrorist Attacks by Advanced Instruments**

For example, the search for hidden explosives or explosives traces should be depended on the upgrading and replacement of the security equipment, equipping with a new explosive detection system, random checks of passengers, scanning finger tips, subway tickets and clothing, etc. T-ray (terahertz) and millimeter-wave scanners, electronic listening devices, nonlinear node detectors, etc. are also should be installed at important subway hub sites to conduct security checks and detect items hidden under clothing to detect potential terrorists. In addition, new technologies and new products should be researched and applied to transfer the manual verification into intelligent comparison, keeping the danger out of the door by security check.

##### **4.2.3. The safety Prevention System Is Guided by Technology Prevention**

Under the new situation, it is necessary to continue to improve the security prevention system, taking the technology

prevention as the guide and the human defense as the foundation. This requires that new technologies and new equipment should be applied actively on the basis of the original security inspection system. The investment in new technologies and new equipment will play an extremely important role in the prevention of violent terrorist activities in the rail transit. The government must be willing to invest in security inspection equipment and intelligent monitoring equipment. In addition to continuing to strengthen and improve traditional security systems such as video surveillance and intrusion alarm, some new technical defense measures and equipment should be added, such as the application of face recognition systems in urban rail transit. It will provide an intuitive means of warning against terrorist activities. For example, when the camera in the vehicle compartment detects an abnormal situation, it will automatically alarm and provide important clues to the public security agency. Another example is the electronic fence technology, which can send appropriate information to the personnel in a specific area (Inside the carriage or the platform) to guide the evacuation and escape in the event of a terrorist attack.

##### **4.2.4. Establishing a Collaborative Emergency Response Team**

Urban rail transit emergency response forces mainly include the rail public security organs, security departments and Security forces in rail operation companies. [12-14] The government must lead the public security organs and track operation departments to establish policing systems and operational mechanisms that are compatible with anti-terrorism, formulate scientific emergency plans, and conduct emergency drills. Armed patrols without scheduled routes and times in important places and regions should be conducted under the guidance of intelligence, taking the rail station as the basic unit which is integrated the police, security personnel, security inspectors, station staffs as the minimum combat unit. In this way, the deterrence of police will be increased in these areas for the growing visibility of police. Strategies of the combination of routine inspections and special monitoring should be carried out to ensure emergencies be discovered timely and handle the situation effectively in the first time.

## **5. Conclusion**

At present, the terrorist incidents on the rail transportation are on the rise. So there are many contents and difficulties in prevention and control of terrorist attacks, which is a new topic and a new field for all countries. In order to strengthen the counter-terrorism work, we should attach importance to it strategically and tactically, and construct the anti-terrorism system of rail transit in the aspects of anti-terrorism legislations, risk assessments, security measures, detection measures, functional departments, emergency disposals and so on. It is hoped that these preventive and control measures will bring ideas to the public security organs and operation

departments of rail transit to jointly deal with the counter-terrorism work, and promote the smooth and rapid development of the rail transit.

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