Research on the Airport Security Inspection System Based on Passenger Classification

Qin-qin Wang and Dong Wang

ABSTRACT: As the airport passenger throughput continues to increase, issues such as the long waiting time of airport passengers must be resolved. Based on the principle of airport passenger classification, according to the process standards for classified security inspection of airport passengers, it is necessary to establish and optimize airport security inspection system model based on passenger classification, conduct scientific analysis and calculation of airport assignment, build advanced airport security inspection system in line with passenger classification, and shorten security waiting time for airport passengers as much as possible so as to enhance the satisfaction of airport passengers.

Key words: passenger classification, airport, security inspection, system, research.

THE SIGNIFICANCE OF RESEARCH ON AIRPORT PASSENGER CLASSIFICATION SECURITY INSPECTION SYSTEM

At present, the rapid development of domestic civil aviation industry has led to an increase in air traffic volume and an increase in airport passenger throughput. In the new era, the airport is required to continuously improve its service level, give full play to airport resources and does a good job of airport security inspection based on passenger classification, reduce airport passenger retention time and waiting time, build an advanced airport security inspection system to enhance security inspection efficiency, airport service quality and operational efficiency, ensure the safety of passengers and enhance the satisfaction of airport passengers on the overall arrangements and services of the airport.

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It is necessary to apply effective management methods in the airport security system research to define the scope of the project, and study the shortcomings of service process according to the ability and process of service to improve the service quality of airport security inspection. The informatization, security support capacity and management of airport security inspection is to be improved, such as danger automatic detection equipment and checked baggage security inspection system, to ensure real-time, stability and functionality. To meet the needs of airport safety inspection, the airport security inspection technology needs to be improved and innovated. Besides, the security inspection process and technical configuration should be studied to improve the efficiency of airport security inspection.

THE AIRPORT SECURITY INSPECTION SYSTEM MEDEL BASED ON PASSENGER CLASSIFICATION

Equipment of Airport Security Inspection System

Airport security inspection efforts must be strengthened to prevent the occurrence of malignant events such as airport passengers hijacking airplanes, and to ensure the personal safety of airport passengers. All airports are equipped with security checkpoints, mainly used to scan the airport passengers and other baggage, whether possession of contraband or other dangerous goods. Due to the existence of terrorist attacks, the airport must ensure the safety of aircrafts, and the content of the security inspection will be increased, and the time will be longer. Time spent on airport security inspection affects the mood of passengers, and also affects the travel way they will choose. Airport invested a lot of money to improve the airport security inspection equipment and processes, such as increasing staff services for congestion, which effectively reduces the waiting time for airport passengers, but pays a lot of costs. Airport passengers also have a big headache for the difference of airport security inspection teams, arriving too early will increase the airport congestion, and too late to arrive may miss the flight. Attempts are made for increasing security inspection and reducing waiting time for airport passengers to set up security inspection processes. When using EDS, the inspection speed was 160 to 210 pieces of baggage per hour, with an accuracy of 98.50%, assembly cost of $100,000 per station, and equipment usage of 92%. While when using ETD, the inspection speed is 40 to 50 pieces of baggage per hour, the accuracy rate is 99.70%, the assembly cost is 40,000 Yuan per set, and the utilization rate of the equipment is 98%. The number of eight types of flights at airport A was 10, 4, 3, 3, 19, 5, 1 and 1, respectively; airport B was 8, 6, 7, 5, 9, 10, 2, 1, and the number of passengers on various flights was 34, 46, 85, 128, 142, 194, 215, and 350, respectively. District A: airport passengers arrive at the security checkpoint, waiting for airport
security inspectors to check identity and boarding documents. District B: airport passengers move to the next security checkpoint, and the airport opens the corresponding security checkpoint according to the time flow of airport passengers. The airport passenger closest to the airport security checkpoint accepts the security inspection of the X-ray equipment. Airport passengers cooperate with the security inspection, putting the shoes, belts, outerwear and electronic products in a specific box for the fluoroscopy, while portable computers and medical equipment in another specific box according to the regulations. All items arrive at the testing equipment by conveyor belt, sorted out or inspected directly by the inspectors. At the same time, the airport passengers accept microwave scanning or metal detectors scanning. Passengers who did not pass through the procedures will be given detailed checks by inspectors and transferred to District D. Area C: Relatively safe area, airport passengers retrieve the baggage on the other side of the conveyor belt and pack it up, leaving the airport inspection area.

Special Measures of Airport Security Inspection System

VIP airport pre-check service can be added to the airport. For example, airport travelers can receive background check service in advance to enjoy the VIP inspection process with annual limit. VIP passengers pass through the security inspection process just like other airport passengers, but they do not need to take off shoes, belts, outerwear, or even computers, and check only for their carry-on electronic products and liquid containers, to accelerate the speed of airport security inspection. In the design of improvements, basically three ordinary channels can complete the pre-check service. As the airport security inspection procedures of VIP passengers enjoying pre-check service are much less than of ordinary passengers, the inspection time of the VIP passengers can be set to 70% of ordinary passengers’, while suspected passengers need longer time to pass through the security inspection, whether they have to enter district D for inspection needs to be decided according to the actual situation. In addition, VIP passengers enjoying pre-check service passing through the microwave scanner has an 80% pass rate and metal detector pass rate of 20%. The number is just the opposite of ordinary passengers’, as they passing through the microwave scanner have 20% pass rate and metal detector pass rate of 80%. The solution of the model is: It is known that the arrival time of passengers is 45~120 minutes before the plane takes off, and we assume that the plane takes 140 minutes to take off. So we constructed a timeline of 260 minutes. Passengers arrive at the zero, the plane begins to take off at the 120th minute, and the departure lounge closes at the 215th minute. The passenger arrival time is zero to 215, and after 260 minutes the peak is over. So \( \mu = (260-45)/2 = 107.5 \). By the 3\( \sigma \) principle, \( \sigma = 215/6 = 35.8 \). Finally the EDS number of airport A is get: EEDS=11, and EDS number of airport B: NEDS=12.
Cultural Differences of Airport Security System

In the process of actual airport security screening, cultural differences in different countries tend to cause different habits and affect the research on airport security inspection system based on passenger classification, such as the cultural difference of different importance attached to personal space, collective efficiency, and domestically personal efficiency. The analysis of cultural differences affects the airport security inspection process, adjustment of security systems out of respect for airport passengers will also promotes passenger flow and reduces airport passenger inspection time. Aged respected is a tradition in our country. There should also be regulations on priority services for the elderly and infirm. However, if a special channel is added for this purpose, resources will be wasted. In view of the fact that airport security resources are limited, there is no special access but the function of special access can be reserved, and certain degree of flexibility can be given to airport passengers such as those the elderly and infirm are allowed to pass first, and the airport staff should do a good job of explanation for this special queue-jumping behavior. On account of the average waiting time for airport passengers, airport passenger waiting time standard deviation and passenger throughput at the peak of the airport, the airport security inspection system based on passenger classification should be improved. In addition, as for goods inspection time in the airport security inspection, conveyor belt can be added at each major node to reduce the inspection time, and airport passengers can choose the nearest node to pass through the security inspection area. When family based passengers pass through airport security inspection, considering the general dislike to disperse to different queues, the airport security inspection can be differentiated according to the actual situation, so as to reduce the impact of airport security on the family based airport passengers. As for ordinary airport travelers, they should take off their shoes, belts and outerwear when passing airport security inspection. Seasons, women and other factors should be fully considered, and necessary discriminatory approaches will not only reduce the waiting time but also improve the satisfaction degree of airport passengers. The research on the airport security inspection system based on passenger classification must take into account the peak and trough hour of airport passengers arriving at the security checkpoints, which can be analyzed specifically according to historical data and ticket sales. The airport security channels should be opened in advance according to the flight plan and ticket sales. The actual situation passengers buying tickets on the day or in advance must be fully considered to cope with peak hour of the arrival of airport passengers. According to the proportion of pre-flight VIP passengers and ordinary passengers in the airport, the pre-inspection nodes and common nodes should be arranged reasonably for security inspection so
as to improve the traffic efficiency of airport security inspection and reduce the waiting time for airport passengers. Besides, according to the cultural differences among different countries and respecting the cultural characteristics of each country, appropriate baggage inspection preparation areas and a certain number of finishing areas should be added in the airport to accommodate more foreigners to prepare and arrange carry-on baggage at the same time so as to make full use of the conveyor belts. Uncivilized behaviors such as line-jumping must be strictly prohibited within the airport, but the elderly and infirm can be given priority to go first to show the care for vulnerable groups and show the humane care of the airport.

**OPTIMIZATION OF AIRPORT SECURITY INSPECTION SYSTEM BASED ON PASSENGER CLASSIFICATION**

In the process of airport security inspection, the main inspection links such as personal examination and open-trunk examination can be properly optimized, such as taking standardized measures to reduce the service time. In security inspection process, the airport security officers have non-standard operation due to the lack of training, lack of necessary communication in the course of work when facing airport passengers. Moreover, the time of service shift of airport security inspectors will also affect the service efficiency, and the service detection time of different security personnel has a big fluctuation in the same kind of detection process. Therefore, sound operating standards and processes must be laid down for airport security inspection work, and airport security personnel should receive regular training to improve the professional competence and operational level of security inspection work. In the airport, the arrangement of the personnel of security inspection channels should be flexible, and the manpower should be added appropriately to cope with the rush hour. For example, the speed of security inspection equipment is much faster than of hand inspection staff, which easily making the airport passengers stranded on the scene, so it is necessary to increase manpower and improve their detection efficiency to keep pace with security inspection equipment. In view of the long waiting time for airport passengers to pick up their baggage, the airport can increase the number of such as x-ray equipment, strengthen the airport passenger baggage diversion, and set up a dedicated platform to arrange airport staff to assist airport passengers in arranging baggage, so as to shorten the time of airport passengers picking baggage, and ensure the smooth of security inspection process. The statistical analysis data shows that personal examination takes the longest service time in airport security inspection. It is necessary to strength the training of airport staff and set up special passenger baggage check and sorting platform to shorten the time of airport passenger picking baggage. After the security door gives an alarm, open-trunk examination must be carried out. In the conduct of personal
examination, inspectors can put the baggage neatly for passengers to pick up after the completion of the security inspection, and can also help passengers tidy up baggage. Besides, airport security zone layout can be adjusted according to the actual situation.

CONCLUSION

Based on the research of airport security system based on passenger classification, the paper establishes the model to carry out the related our of airport security inspection, which reflects the importance of strengthening the working ability of security staff, the way of airport passenger queuing and the number of open service counters. Security facilities resources must be allocated dynamically, and security inspection process must be optimized from the perspective of economy and convenience, so as to so as to enhance the airport's scientific operation efficiency and advanced service levels.

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