

# Analysis on the Ability and Quality of Civil Aviation Safety Inspectors under the Background of Smart Airport Construction

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**Abstract:** Under the background of the construction of smart airport, this paper discusses the new ability and quality requirements of civil aviation safety inspectors. From the opportunities and challenges brought by smart airport, it points out that the work of civil aviation safety inspectors under this background presents the working characteristics of gradually realizing open, full-process self-service and paying more attention to passengers' comfortable and convenient experience. Different working characteristics require traditional security inspectors to turn into intelligent security inspectors. Smart security personnel have established a deep communication relationship between passengers and smart equipment. They need to have fast emergency response capability and accurate decision-making and judgment capability, and be the emergency responder guarantors of smart security equipment. According to different working characteristics, the article puts forward several suggestions to enhance the sense of urgency, mission and responsibility of safety inspectors, adjust the training scheme of safety inspectors, and improve their emergency handling ability and decision-making judgment ability.

## 1. Introduction

The rapid development of Internet of things, cloud computing, artificial intelligence and big data technology has ushered in new opportunities and challenges for the development of civil aviation airports. The rapid rise of technological revolution and industrial transformation with the important feature of "wisdom" has had a profound impact on people's production, life style and even thinking mode. The construction of smart airport has become an irresistible development trend and one of the important tasks of civil aviation construction. In the construction of smart airport, human is an important factor of development. At present, the research and construction of smart airport and smart security check are mostly focused on equipment and facilities, infrastructure and technical system, mainly in the aspects of self-service equipment and self-service in the whole process of passengers, while the factors of security check personnel and service personnel are seldom discussed. How to make our security inspectors keep pace with the development of the smart airport, adapt to the smart environment, apply smart equipment, give full play to the role of smart equipment, make up for the shortage of smart equipment, and make the security inspectors become smart security inspectors is an important part of the deepening construction of the smart airport. The construction of smart security check under the development trend of smart airport construction puts forward new requirements for security check personnel.

## 2. Development Status of Smart Airport and Airport Security Inspection

### 2.1 The Concept of Smart Airport and Relevant Policies

At present, there is no uniform definition of the origin and concept of the term smart airport. Sun Wei believed that the concept of smart airport originated from smart city. He thinks that the definition of smart airport includes four aspects: technology selection, application methods, core contents and work objectives of smart airport. In short, it is "technology, method, content and goal" [1]. Luo Xiao believes that at this stage, the construction and development of the "Smart Airside",

"Smart Terminal" and "Smart Land Side" must be realized in order to fully realize the "Smart Airport". Smart airports can be defined as the use of new generation information technologies such as Internet of Things, big data, cloud computing and mobile Internet to fully cover the airport's air, terminal and land areas, and to realize fine, collaborative, visual and intelligent operation and management of flights, passengers, luggage and vehicles [2].

This paper adopts Yao Yabo's definition of smart airport: in the environment of large hub airports, multiple organizations participate in the operation and management. Wisdom needs to be diffused in each main body of the airport and integrated into the people and organizations, business processes, equipment and systems in the airport, so that the entire airport has fast and accurate decision-making ability. We call it "smart airport". The three core elements of Smart Airport are: people and organizations, business processes, equipment and systems. "

In recent years, relevant policy documents on smart airports have been issued continuously. In order to help build smart airports, China's civil aviation is taking the construction of "smart airports" and "smart air traffic control" as breakthrough points to explore a smart development path. In September 2017, the Ministry of Transport issued the "Intelligent Transportation to Make Travel Easier Action Plan (2017-2020)", which proposed: "Promote the construction of intelligent airports, guide and promote travel information service enterprises to use advanced technologies such as communication, GIS, GPS, Internet of Things, mobile Internet and big data analysis to sense and locate service objects and assemble service information. At the right time, in the right way, push the right service to the right target, and encourage and support airport operators to carry out smart airport passenger service demonstration. "In the 13th Five-Year Plan for the Development of Civil Aviation Science and Technology, the Civil Aviation Administration proposed intelligent production demonstration, intelligent safety demonstration and intelligent service demonstration. In September 2017, the "Work Conference on Accelerating the Construction of Civil Aviation Infrastructure" was held in Chengdu, Sichuan. Feng Zhenglin, party secretary and director of the Civil Aviation Administration of China, attended the meeting and stressed that it is necessary to speed up the construction of civil aviation infrastructure, promote the construction of safe airports, green airports, smart airports and humanistic airports, vigorously promote the development strategy of a strong civil aviation country, and make new and greater contributions to the economic and social development of the country and local areas. Among the "four airports" stressed at the meeting, the smart airport is the one with the most characteristic of the times and sense of technology.

In the "Medium and Long Term Development Plan for Civil Aviation Industry (2013-2020)" issued by the Ministry of Industry and Information Technology and the Ministry of Information Technology, it is proposed to build an innovative aviation industry system with a reasonable industrial structure, a combination of military and civilian, and a combination of production, teaching and research, to expand and form a complete industrial chain, to promote the development of civil aviation industry, and to speed up the construction of intelligent civil aviation. In the next step, the Ministry of Industry and Information Technology's information and software services industry will promote the deep integration of the Internet, big data, artificial intelligence and the real economy. This will further promote the further application of the new generation of information technology in the civil aviation field, help the construction of intelligent civil aviation, and promote the innovative development of civil aviation.

In December 2018, the Civil Aviation Administration issued the "Outline of Action for Building a Strong Civil Aviation Power in the New Era," which mentioned that the smart airport demonstration project should be implemented, the research and development of new technologies and new products in airports should be strengthened, the revolutionary changes in airport control mode and service mode should be promoted, and "smart operation", "smart service" and "smart management" should be realized.

With regard to the construction of smart airports, the state is providing all-round support and guidance from various policy levels. The development of smart airports will become an irreversible trend in future airport development, and the construction of smart security checks will also develop with the construction of smart airports. As one of the main roles in the development of intelligent

security check, civil aviation security check personnel's ability and quality will also change. We should conform to the development trend, sense the changes in development and make preparations in advance to adapt to the changes.

## **2.2 Development Status of Smart Airport and Airport Security Inspection**

According to the Report on Market Operation Situation Analysis and Investment Prospect Forecast of China's Smart Airports Industry from 2019 to 2025 released by China Economic Industry Research Institute, in terms of smart airport construction, the amount of investment in this field during the 13th Five-Year Plan period will be higher than that during the 12th Five-Year Plan period. Assuming that during the 13th Five-Year Plan period, China's average investment in smart construction per airport will increase by 50% to 75 million yuan compared with the 12th Five-Year Plan period, China's smart airport investment will reach 17.4 billion yuan during the 13th Five-Year Plan period. From the data, we can see that the construction of our intelligent airport is in a period of rapid development. The results of investment in development have also been shown in major airports. In the construction of smart airport, the intelligence of security check equipment is also developing and applying rapidly.

Since 2017, Guangzhou Baiyun International Airport has been fully promoting the construction of "Smart Airport". In terms of security check services, a series of scientific and technological innovation projects such as electronic "two-dimensional code" over-checking, replacement of "double-view" X-ray detectors in security check channels, introduction of "face recognition" verification system testing, etc. have been introduced to continuously optimize the check procedures and improve the check efficiency. In December 2017, they also introduced 3D imaging security screening guidance equipment to enable virtual security screening guidance staff to "go on duty" 24 hours a day to provide passengers with knowledge and warm reminder services on boarding security checks. In February 2019, Guangzhou Baiyun Airport also integrated new technologies such as face recognition, person-bag correspondence, and millimeter wave security gate and basket return into one system to realize a truly safe self-service channel for domestic civil aviation.

It is reported that in Shanghai Hongqiao T1 Terminal, the whole process of self-service security check only takes 12 seconds. This greatly improves the passing efficiency, reduces the waiting time of passengers in line, and improves the traveling experience of passengers. In the application of all subsystems of the full self-service process, face recognition technology and image analysis technology are adopted, and advanced artificial intelligence algorithms are applied to assist security personnel in fulfilling airport operation safety management requirements such as passenger check-in, luggage delivery, identity verification, etc., so as to ensure the safe operation of the airport, improve the security inspection accuracy rate, improve the security inspection passing efficiency, and reduce the work intensity of security personnel. At the same time, they changed the passive acceptance of tourists into active participation. Passengers will have more autonomy when they complete all aspects of operation by themselves, and they will have a higher sense of participation and travel experience.

In 2019, Qingdao Jiaodong International Airport made a major breakthrough in "smart service", focusing on creating "Three ones" service for travel "one face", "one card" and "one screen". That is, efficient travel can be realized through advanced technologies and methods such as face recognition, one-card customs clearance and self-service navigation. Of the 40 security check channels planned for Jiaodong Airport, only 6 are manual counter channels, and the rest are all intelligent verification channels using face recognition technology. On the basis of improving passengers' travel experience, the manual cost of the airport is greatly reduced.

From the above data, we can see that the state's investment in smart airports is increasing year by year, and the hardware facilities for smart security check and smart security check in major airports have also made great strides. This greatly improves the efficiency of passenger security check and brings more convenience to passengers.

### **3. Different Characteristics of Civil Aviation Security Inspection in Smart Airport**

Smart airports are an inevitable trend of social development, and "airports are like a small society, with rich knowledge and experience, and intelligent personnel and organizations are the foundation of smart airports." [3] As a human factor in intelligent security check, how to keep up with the pace of intelligent construction and become an intelligent security check is a problem that we need to consider and explore urgently.

At present, the research and construction of smart airport and smart security check are mostly focused on equipment and facilities, infrastructure and technical system, mainly in the aspects of self-service equipment and self-service in the whole process of passengers. However, there is less discussion on the factors of security check personnel and service personnel. How to make our security inspectors keep pace with the development of the smart airport, adapt to the smart environment, apply smart equipment, give full play to the role of smart equipment, make up for the shortage of smart equipment, and make the security inspectors become smart security inspectors is an important part of the deepening construction of the smart airport. In the traditional airport environment, the civil aviation security check work is more about the security inspector completing the check task through a set of body movements according to the prescribed process and operation steps. Standing, turning, touching and squatting are all common postures and movements in traditional safety inspection. The traditional safety inspection work is more about the security inspectors standing passively on the security inspection passage waiting for passengers to come and inspect. Under the background of Smart Airport, the security inspection work moves from passive to active, from the channel to the front end. Through the data collection and analysis in advance, the safety level of passengers is classified and reminded in advance, which greatly reduces the work pressure of security inspectors. In the development of intelligent security check, security check has the following obvious characteristics:

#### **(1) Gradually realize the open self-service of the whole process**

The rapid development of artificial intelligence, big data, cloud computing and other technologies, as well as the growing maturity of biometric technology, have all improved the technical support for security check work to achieve full self-service. For example, in Shenzhen Airport, the pass rate has increased by 40% in the trial of fast self-service channels. Another example: at Changi airport in Singapore, a self-service "Fast Passage" (also called FAST) process including the use of facial recognition technology was adopted. Face recognition technology is used to verify the identity of passengers and is used in luggage check-in, customs clearance and boarding. Sweeping robots and centralized security check areas adopt new CT technology, and passengers can complete security check without taking out computers and tablets in their bags. Theoretically speaking, a passenger does not need anyone's assistance from checking in to boarding at Changi Airport T4. Security checks are more convenient and efficient. Open full-process self-service security check service has become an important target for the development of smart security check.

#### **(2) Security check pays more attention to passengers' comfortable and convenient experience**

On the basis of ensuring safety, passengers' demand for intelligent security check is also reflected in the experience of each check link. IATA reports show that more and more passengers want paperless travel and intelligent processes, and expect more personalized interactive and experiential intimate services. It can be seen that with the construction of Smart Airport, passengers are increasingly demanding more convenient and comfortable experience for security check and customs clearance. Tourists' comfortable and convenient travel experience has become an important measure of true service.

### **4. Challenges and Capability Requirements Faced by Security Inspectors in the Context of Smart Airports**

The continuous development of biometric technology, artificial intelligence (AI) technology and CT technology has promoted the continuous development of intelligent security check, brought us a lot of convenience and relieved the pressure of many security check personnel. But at the same time,

it also brings us unprecedented challenges.

#### **4.1 Smart security inspectors have established an in-depth communication relationship between passengers and smart devices.**

Intelligent development of security check is a new technology based on artificial intelligence. It is a new technology that combines, develops and applies traditional security check technology, methods and theories with modern computers. The implementation of intelligent security check is essentially the application of artificial intelligence technology, which depends on the development and wide application of computer technology. Master basic computer application ability and understand information under big data; through information conversion into practical significance in actual working scenes; embedding the data from the actual working scene into the computing system becomes an operable automatic process in the intelligent system. These points have become important qualities of security inspectors in the development environment of intelligent security inspection. Therefore, the ability of computer information conversion and identification is also indispensable in the training of future intelligent security inspectors. Smart security inspectors should have a mode of thinking with information conversion, rely on technical means and rely on big data to deepen, personalize and refine services. That is to say, there should be cross-border talents: they should not only understand the security check technology and the security check process, but also understand the basic principles and implementation of computer information, which can express passengers' needs through information and endow them with the capability of machine tools. This ability is especially needed in the early stages of the construction of smart security checks.

In the upgrading and development of smart security check systems, how to continuously upgrade smart equipment and accurately capture human feelings and needs requires front-line smart security check personnel to discover the real needs of passengers in reality. And help it to accurately convert into technical means and output by computer system. Only in this way can the service continuously develop in the direction of refinement, coordination, visualization and intelligence, so as to meet the needs of passengers for safety, efficiency, convenience and comfort. In a sense, smart security inspectors create in-depth communication between passengers and smart devices.

#### **4.2 It is necessary to have fast emergency response capability and accurate decision-making and judgment capability, and be an emergency responder behind intelligent security check equipment.**

With the rapid development of intelligent security check, intelligent inquiry robots "go to work" and the opening of self-service intelligent security check channels, the airport is gradually realizing the true full-process self-service and non-sensory check of passengers without lowering the safety standards. However, no matter how smart the equipment is, there are also places where it cannot be done and times when it cannot meet the needs of tourists. Especially when emergencies and special events need help or coordination, people are needed to react and deal with them in a timely manner. In case of emergency, safety inspectors should make decisions through their own perception and logical judgment and use information numbers. Whether it has fast emergency response ability and accurate decision-making judgment ability is especially important when dealing with emergencies. Perhaps, this will also become the "last mile" of smart security services. "The last kilometer" is something that future intelligent security inspectors cannot do with machines and artificial intelligence. They need to be emergency responders behind intelligent security equipment.

### **5. The Cultivation of Civil Aviation Security Inspectors under the Background of Smart Airports**

The training of intelligent security inspectors is an inevitable choice for the smooth promotion and implementation of intelligent security inspection, and is a realistic need to improve the operation efficiency and service level.

### **5.1 Strengthen the sense of urgency, mission and responsibility of security inspectors to become intelligent security inspectors**

To enhance the safety inspectors' understanding of the domestic and international situation and the security situation, to enhance the safety inspectors' understanding of the development trend of the existing technologies, so that the existing safety inspectors can realize that the smart airport is the inevitable choice of the new technological revolution, and the smart safety inspectors are an indispensable element in the smart airport. Becoming an intelligent security inspector is an urgent need to improve security inspection efficiency and service level. It is necessary for the safety inspectors to realize that if they do not strengthen the study of new skills at this time, they may be eliminated in the future and lose the opportunity to engage in civil aviation safety inspection. Security inspectors should be trained to set up the vision goal of intelligent over-inspection, efficient and comfortable travel, and they should be trained to have the mission of intelligent change, the feelings of humanistic care, and the consciousness of actively improving the travel quality of passengers. It is necessary to train the security inspectors to have the innovative thinking of constantly discovering the needs of passengers and proposing multiple innovative security inspection methods, and to have the thinking of converting the needs of passengers into intelligent application.

### **5.2 Adjust the training plan of security inspectors, and add the application of new security technology, computer information and artificial intelligence related learning content**

Adjust and optimize the training program for security inspectors, and set up the application of new security technology, basic computer courses, intelligent equipment principles and other related contents in the training program. Let security inspectors understand the development trend of artificial intelligence, cultivate the life style, learning style and thinking style in the development environment of artificial intelligence, so as to adapt to the future intelligent era of human-computer cooperation, cross-border integration and co creation and sharing.

### **5.3 Improve the emergency handling ability and decision-making judgment ability of security inspectors**

According to Ta Kung Net, due to the large number of challenges facing the global security situation, the combination of artificial intelligence and security has attracted worldwide attention. It is reported that the total output value of the global security industry will reach 360 billion US dollars (about 254 billion RMB) in 2019. Our security technology is developing faster and faster, but the global anti-terrorism situation is becoming more and more severe, new criminal methods are becoming more and more diversified, and contraband patterns emerge in endlessly, making it more difficult to distinguish and find out than before. Among the problems that cannot be solved by intelligent security inspection equipment, the emergency handling ability and decision-making judgment ability of security inspectors are the key to deal with the problems.

The cultivation of smart security personnel is an important factor for the development of smart airports and smart security as well as a decisive factor. Therefore, the cultivation of intelligent security personnel should be deeply integrated into all aspects of the construction of intelligent security. Smart security personnel will make the service of smart security equipment smoother, more cordial, warm, comfortable and natural.

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