

Research on the Apron Operation Control System in Chinese Airport

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Abstract: With the rapid development of air transportation, the scale of airports continues to expand, and many large airports with multiple runways, multiple terminals and multiple aprons have emerged. These large airports generally have the characteristics of complex layout and large ground traffic flow, and their high operating density has become normal. In order to ensure the safety and efficiency of large airports, optimize and improve aircraft apron operation and management, the Civil Aviation Administration has carried out special research and pilot work on apron operation and management methods.

1. Introduction

The transfer of apron control refers to the transfer of the command authority for aircraft apron operations from the air traffic control department to the airport on-site command and management unit. Its purpose is to enhance the safety of aircraft apron operations, improve the efficiency of apron operations, and optimize the apron operating space. Judging from the actual operation experience of large airports in European and American countries, apron control has been successfully implemented in large airports such as Atlanta, Dallas and Houston, Germany and other large airports for more than ten years, and most of them have more than one. The dedicated apron tower directly commands the apron operation of the aircraft. Obviously, this approach is an inevitable trend for the development of large airports in the future (Chen 2015).

At present, there are more and more airports in China with complex general layout configurations composed of multiple runways and multiple terminal areas. As the aviation business volume of these large airports continues to grow, the apron traffic volume also grows rapidly. Traditional airports Ground control methods can no longer meet the apron operation and management needs of large busy airports. For this reason, China's civil aviation officially initiated the transfer of ramp control in 2013.

2. Classification of China's Apron Operation Control System

At present, the apron control handover process in China is still in the exploratory stage as a whole. Only a handful of airports have completed the apron handover. Some airports are in the handover trial operation stage, and most airports are still in the stage of preparing handover areas and handover methods. For airports currently in the trial operation stage, their apron control handover areas, handover procedures and methods are different. In order to maximize the safety and efficiency of aircraft operations after the control handover, local airports need to weigh their own characteristics, For the scale of aviation business volume and the operational resource reserves of “human, financial, material, and technological”, two trial operation modes, time-sharing handover or all-weather handover are selected in terms of time, and two modes of overall handover or divisional handover are selected in space. From the perspective of the division of different space areas of the apron handover, according to the characteristics of different airports, there are different handover modes such as priority handover tower control blind zone, base airline apron, terminal area apron, and dedicated apron minute. Generally, the zoning handover mode is determined in the trial operation stage. The choice of different handover modes by the airport will have different effects on operational safety and efficiency, operation management system, handover process, capital requirements, etc. The specific handover plan of each airport can also be based on its own situation. Optimize the combination design based on the above-mentioned basic handover mode.

3. Analysis on the Weak Links of Aerodrome Operation Efficiency

The takeoff and landing of the flight is ensured by the cooperation of the three main bodies of air traffic control, airport and airline. The level of flight operation efficiency is closely related to the level of operation efficiency of the three main bodies. Take China’s Capital Airport as an example. Its aircraft ramp control is in charge of the ground seats on the Beijing Tower of the North China Air Traffic Management Bureau. On the one hand, it can reduce flight transit time and improve operation efficiency. On the other hand, it can reduce fuel consumption, solve costs, and reduce airport environmental pollution (Du and Peng 2015).

In terms of transit security, on the one hand, the transit security is partly completed by the airport and partly by the airline or ground agent. Sometimes airlines or ground agents cause flight overtime guarantees, which in turn leads to excessive use of airport resources. In terms of launch, during the peak period of in and out of ports or when the flow control is severe, the air traffic control is busy deploying aircraft in the air, and often has no time to consider ground launch applications, especially applications for towing aircraft, which can easily lead to increased flight delays and use of gates. The rate is reduced. The current situation is that the trailer resources are relatively tight, and sometimes the aircraft cannot be launched in time because the trailer cannot be in place. Sometimes the trailer is in place, but the launch permit has not been obtained, which also caused a waste of trailer resources. In addition, due to problems in the maintenance management of some airlines, during the check-in and roll-out process, the flight cannot be loaded or rolled out in time, which leads to an increase in flight transit time and a decrease in airport operation efficiency (Du and Peng 2015).

4. Analysis of Advantages of Apron Control Operation System in China

In addition to its own management level, operational efficiency is also closely related to the operational efficiency of air traffic control and airlines. With the rapid growth of business volume, in order to ensure that the operational support capabilities of large airports match the business growth

trend, one of the effective methods is to receive aircraft ramp operation management by the airport, that is, ramp control is the responsibility of the airport (Luo 2012). The potential benefits of airport access to “ground control” may be reflected in the following aspects:

4.1 Efficiency Improvement

In the apron, apron control seats will be on duty with the assigned seats. For outbound flights, the apron control seats will increase the towing of outbound flights, increase the utilization rate of bridges, and improve the efficiency of flight ground protection; For inbound flights, allocate seat resources in time, reduce aircraft taxiway waiting time, and improve passenger service satisfaction(Marín and Codina 2008).

4.2 Improved Deicing and Snow Removal Efficiency

In the apron control operation system, the apron control seat will be responsible for directing the aircraft to taxi to the designated deicing position during the entire deicing process, establishing the most direct communication with the crew, understanding the crew’s needs, and actively cooperating with the deicing work of the flight area management department to ensure Information transmission is smoother and command coordination is more effective, which is conducive to improving the operational efficiency of the deicing pad in snowy weather.

4.3 Accidents Handling Efficiency Improvement

In the apron control operation system, the apron control seat will maintain the most direct communication with the apron monitoring seat and the airline's ground support department to keep abreast of flight support details, strengthen the monitoring of the apron operation order, and encounter abnormal events, especially Special events occurring in the apron can be notified more timely, monitored more effectively, and collected more comprehensively. At the same time, the apron control seat can adjust operating resources and operation methods in time, temporarily control the affected area, and cooperate with incident handling.

4.4 Improved Information Delivery Channels

In the apron control operation system, the most direct information can be obtained, ensuring the timeliness and accuracy of information, maintaining the most direct communication with the crew, and understanding the crew’s intentions, passenger conditions and other information, and the information acquisition will be more comprehensive. It greatly cooperates with the operation monitoring work of flight regularity management. For long-time delayed flights, once the delay restriction is cancelled, timely coordination of guarantee units guarantees priority release(Huang 2002).

4.5 Improve the Professional Quality of Airport Employees

As a highly professional position, the apron control seat has high requirements for the professional quality of the personnel. It requires initial training and continuous proficiency training including basic air traffic control theoretical training, standard communication training and simulator training. The apron controller must meet the requirements for placing orders on the ground command position of the

air traffic control tower. In the ramp control operation system, it is necessary to strengthen the introduction and training of professional talents, which is conducive to the construction, training and growth of airport professionals, and is conducive to improving the overall level of employment of large-scale airport employees.

4.6 Industry Management Status and Navigational Revenue Increase

In the apron control operation system, the airport can actively participate in the aircraft operation guarantee work, which can improve the operation management ability, increase the voice of the airport in the operation business, optimize the airport resource allocation, and improve the overall operation efficiency, which is bound to improve the airport in the industry Management status(Garc, et al 2005). At the same time, since the airport control service will be provided by the Capital Airport, the airport can receive flight charges, which is conducive to the improvement of the airport's efficiency (CAAC 2012).

5. Conclusion

As the total number of operations continues to increase, how Chinese airports can improve operational efficiency is of vital importance. Transferring the aircraft apron operation management to the airport management agency is one of the effective ways to improve the operation efficiency of large airports. Currently, various regional governments are conducting pilot work at airports in their jurisdictions. However, for the airport authority, the recent ramp control business can be described as increased operational risk and increased operational revenue. In the medium and long term, the introduction of advanced intelligent technology by the airport field command to lead the ramp control business will be the only way for large airports to operate as a hub.

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