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The Experience of Air-Rail Transport in Airports at Home and Abroad and Its Enlightenment to Guangzhou

Ming Su [a, *], Xiaojun Deng [b]

Guangdong University of Foreign Studies South China Business College, Guangzhou 510545, China.

[a, *] xiaoming21365@126.com, [b] dxengxiaojun@sina.com

Abstract. In recent years, high-speed rail transport and air transport have developed rapidly at home and abroad, and the competition between railway transport and air transport is becoming increasingly fierce, but there is also room for cooperation. Overseas Heathrow Airport, Skip Airport, Charles de Gaulle Airport, Frankfurt Airport before and after the provision of air rail transport services, which have an impact on the domestic airport cities. This paper makes a comparative analysis of the air-to-rail intermodal transport in the main airport cities at home and abroad, and obtains the following conclusions: saving the transfer time, shortening the distance between the air rail hubs, and vigorously developing the air rail transport by goods. Introduction of private capital investment in the construction of air-rail combined transport facilities and other five aspects of enlightenment.

Keywords: airport cities, air-to-rail transport, experience, enlightenment.

1. Introduction

At the beginning of the 21st century, China's high-speed railway began to operate, and domestic high-speed rail began to build on a large scale. [1]At present, China's high-speed rail operation mileage is nearly 30,000 kilometers. Competition between high-speed rail and air transport is growing, but there is room for cooperation. In 1977, London Heathrow opened the subway and introduced the subway and introduced to the airport. Subsequently, the Netherlands Skip Airport, the French de Gaulle Airport and the German Frankfurt Airport introduced rail transit one after another. Providing air and rail transport services. [2]Air-iron intermodal transport products from foreign air port cities have played a good role in demonstrating to China. Since 2011, domestic Tianjin Airlines, Eastern Airlines, Southern Airlines, Air China, Hainan Airlines, Sichuan Airlines and other airlines have launched air-rail combined transport service products.

2. Comparison and Analysis of Main Airports in Foreign Countries Through Urban Air-To-Rail Transport

Air-to-rail transport in foreign major airport cities is mainly connected by high-speed rail, inter-city railway and subway to the airport. The main airports in foreign countries are usually within 30 kilometers from the airport to the center of the city by rail transit is usually within 30 minutes. As shown in Table 1, many airport cities have more than 2 rail transit lines connecting the airport to the city center, such as Paris de Gaulle Airport through the TGV High-speed, RAR B line to the city center only 28 minutes; Tokyo Narita Airport through Narita Sky Access line, Beijing cost line, JR line can reach downtown Tokyo, trams, light rail, etc., the fastest time can be compressed to less than 50 minutes. At present, the air-rail transport layout mode mainly has the underpass type and parallel type. Parallel type is usually subway, ordinary railway, high-speed railway station and airport aviation area, terminal and office area parallel layout. Underpass type refers to subway, ordinary railway, high-speed railway station through airport flying area, terminal and office area. Most of the air-to rail intermodal transport in foreign major air port cities adopt the layout mode of underpass, which is helpful to improve the land utilization ratio and save transfer time. There are also airport layout parallel type, the air-rail transport under the type. For example, Frankfurt Airport in Germany has two railway stations, one is S-Bahn light rail ,a regional short-haul transport, located in the basement of Terminal 1 ; the other is ICE high-speed trains, long-distance transportation to other countries or cities, parallel to Terminal 1. And Atlanta's Hazfield –Jackson Airport has only underpass MARTA

subway lines, leading to the city's various stops, basically meeting the need for passengers to change. [3]

Table 1. Comparison and analysis of main airports in foreign countries through urban air-to-rail transport

Airport name	Distance between airport and downtown	The fastest time to get to the center of the city	Rail transit configuration	Air-to-rail combined transport layout mode
Heathrow	24 kilometers	15 minutes	Subway Piccadilly Line, Heathrow airport express	Underpass type
Frankfurt	11 kilometers	10 minutes	ICE high-speed rail,S-Bahn	Run-in,Underpass type
Charles de Gaulle	23 kilometers	28 minutes	TGV high-speed rail,RER B line	Underpass type
Skip	13 kilometers	15 minutes	Dutch national railway	Underpass type
Tokyo cost	68 kilometers	47 minutes	Narita Sky Access line, Beijing cost line,JR line	Underpass type
Hazfield-Jackson	14 kilometers	17 minutes	The North and South Orbital Line in MARTA system	Underpass type

Source of data: Ou Yangjie. Analysis on the Planning and layout of Airport Rail Transit Line and its Application characteristics[J]Railway Transportation and Economy, 2010,(10):77-88.

3. Comparison and Analysis of Air-To-Rail Transport in Main Airport in China

The main air rail intermodal modes in the main air port cities in China are high speed rail, common rail, city rail, subway, magnetic levitation, etc. Most of them are connected to the airport through the subway and the city rail, and individual airports connect with the airports through magnetic levitation, such as Pudong International Airport and Changsha Huangsha Airport. The maglev train from Changsha Huangsha Airport to Changsha South Railway Station (HSR) runs between 11 minutes and 40 seconds due to insufficient passenger flow. The maglev train line from Shanghai Pudong International Airport to Longyang Road is less than 30 kilometers in length, with a single-line running time of only 8 minutes and a speedof 430 kilometers per hour. Due to the high ticket price (50 yuan per trip), the occupancy rate is relatively low. The function of sightseeing tour is obvious.

At present, the relatively successful case of air-to-rail intermodal transport in China is Shanghai Hongqiao Airport, which has four modes of railway transport: high-speed rail, ordinary rail, urban rail and subway, and there are more than one route for each mode of transport,[4]as shown in Table 2, the development trend of domestic air-to-rail intermodal transport is to carry out intermodal transport with airports through more than two kinds of railway transport means, such as Guangzhou Baiyun Airport and Shenzhen Baoan Airport, all of which are improving in this direction. Most of the domestic airport cities can reach the local center of the city by rail transportation in 30 minutes from the airport, while Beijing Daxing Airport, Shanghai Pudong Airport, Guangzhou Baiyun Airport track to the city center the fastest time is about 40 to 70 minutes.

From the main domestic airport air-to-rail transport layout model, most of the airports to implement the underpass layout, such as Beijing Capital Airport, Shanghai Pudong Airport, Guangzhou Baiyun Airport, Shenzhen Baoan Airport; Individual airports have parallel layouts, such

as the Hong Kong International Airport. Shanghai Hongqiao Airport has parallel layout. Shanghai Metro Line2, Line10 and Line17 are set up under the terminal building of Shanghai Hongqiao Airport, and Hongqiao Railway Station and Hongqiao Airport are set up in parallel with Hongqiao Airport 200 meters apart.

Table 2. Comparison and analysis of air-to-rail transport in main airport in China

	Guangzhou	**Beijing**		**Shanghai**		**Shenzhen**	**Hong Kong**
Communication media	Baiyun Airport	Capital Airport	Daxing Airport	Hongqiao Airport	Pudong Airport	Baoan Airport	Hong Kong Airport
high-speed rail,	no	no	Jingxiong railway (under construction)	JingLu,Lukun,Luhang Ningbo,Luhan Rong	Lutong Railway Phase II(under construction)	no	no
common rail	no	no	no	JingLu,Lukun	no	no	no
City rail	Guangfo Ring Line9(under construction) Guanshen(under construction)	no	Section of Intercity Railway Langfang East to New Airport (under construction)	Luhang,Lusu Lake(under construction)	no	Guanshen(under construction)	no
subway	Guangzhou Metro Line 3 extension Line	Beijing Metro Airport Line	Beijing Metro Airport Line	Shanghai Metro Line2, Line10 , Line17	Shanghai Metro Line2	Shenzhen Metro Line11	Hong Kong Airport Express
Magnetic suspension	no	no	no	no	Longyang Road-Pudong International Airport Line	no	no

4. The Experience of Air-Rail Transport in Airports at Home and Abroad and its Enlightenment to Guangzhou

4.1 Saving Transfer Time

Guangzhou Railway Group has signed a strategic cooperation agreement with Baiyun International Airport to establish an air rail intermodal ticketing system and to introduce AI technology to carry out self-service train flight information, ticke printing. At the railway station and airport, green passage is set up, special passage is set up for passengers of air-to-rail intermodal transport, transfer guide sign is hung, security check procedure is simplified, security check is realized, and transfer is carried out many times. Planning and design of subway, light rail, ordinary rail, high-speed rail and other rail lines connected to Baiyun Airport. The establishment of a vertical three-

dimensional transportation system of the up-and-down type enables the Baiyun International Airport terminal to "put on" the link between the light rail high-speed rail and the "underpass" to the subway. [5]Compression Baiyun Airport to the center of Guangzhou City, subway, inter-city railway are operated by the Guangzhou Metro Corporation, at Baiyun Airport by subway, light rail can reduce the time to buy tickets.

4.2 Shortening the Distance between Air and Iron Hub

Accelerate the construction progress of Guangzhou Intercity Railway, Pearl River Delta Intercity Railway Guangfo Ring Line, shorten the distance between Baiyun Airport and Guangzhou Railway East Station. Planning for the new Guangzhou North railway station-Huadu square-Baiyun airport railway line, with passenger and cargo carrying capacity, passenger departure interval within 2-3minutes. Draw lessons from Shanghai Pudong Airport, plan to build a new Baiyun Airport-Guangzhou Railway Station-Dongguan South City-Shenzhen Baoan Airport-Shenzhen Train North Station Maglev train line, designed 5 km/h per hour, the time distance from Baiyun Airport to Guangzhou Railway Station can be reduced to 5-8 minutes, and the distance from Shenzhen to Baiyun Airport can be controlled to about 20 minutes. Taking Baiyun Airport as the center, several new subway lines are planned to form a "meter-shaped" subway line network, thus shortening the space distance between Baiyun Airport and other railway hubs and cities in Guangzhou.

4.3 Raising Intensive Land Utilization Ratio

The construction of Guangzhou air-rail transport related infrastructure needs to occupy a lot of land, but the land resources near the airport are very scarce. For example, the economic starting area of Guangzhou Airport is about 60 square kilometers, and the actual development and utilization of land is about 40 square kilometers. [6]Relevant laws and regulations should be formulated to make full use of the ground, ground and underground space. Improve the intensive utilization rate of land. We can learn from Narita Airport of Japan, covering an area of 10.6 square kilometers, only two runways, cargo throughput of 2.5 million tons per year, rail transit lines are very tight and busy. The Baiyun Airport covers an area of 14.5 square kilometers, has three runways, and has a cargo throughput of nearly 1.9 million tons per year, and air-rail intermodal line only subway line3.

4.4 Vigorously Developing Air-To-Rail Transport of Goods

Learn from Shanghai Pudong Airport experience, add special cargo airport runway. In Guangzhou-Shenzhen-Hong Kong high-speed rail, Wu-Guangzhou high-speed rail "one system" air rail combined cargo transport pilot, improving cross-border goods customs clearance, logistics efficiency. Referring to the experience of air-to-rail intermodal transport at Beijing Capital Airport, we will develop air-rail combined transport products in stages, expand the air-to rail intermodal coverage at Baiyun Airport, and extend the air-to-rail intermodal coverage at Baiyun Airport to northwest Guangdong and even Hunan and Jiangxi and Guangxi and other neighboring provinces. In Guangzhou North Railway Station, the freight distribution center is established, and Baiyun Airport is strengthened. Guangzhou Railway Group cooperates with China Railway Express, Shunfeng Express and other freight enterprises to innovate air rail freight service products. Plan to build Baiyun Airport through Guangzhou North Railway Station to Datian Railway Freight Terminal dedicated line to provide convenient services for air-to-rail combined transport.

4.5 Introducing Private Capital to Investment in the Construction of Air-Rail Intermodal Facilities

The management experience of Heathrow Airport Express Line, S-Bahn Line in Frankfurt, and Sky Liner Line in Narita Airport in Japan is operated by British Airport Group, subsidiary of German Railway Corporation, and Japanese Beijing Electric Power Railway. Introduction of "build-own-operate-transfer" operation mode, construction and operation of Guangzhou North Railway Station to Baiyun Airport directs track. Drawing lessons from the "Hangzhou and Shaotai Railway PPP Project", large private enterprises take the lead, raise capital for the society, the government shares in the project, build together, operate and maintain, and the private capital can be absolutely controlled and franchise 30-40 years. [7]Jointly with WeBank, Meizhou Merchants Bank and other private

financial institutions, Guangzhou "Air-Rail Intermodal Transport" fund project was set up to participate in the construction of "Air-Rail Intermodal Transport" infrastructure. The government could use "air-to-rail" sites along the route to compensate for "air-to-rail" investment companies, in order to attract more investors.

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