

Research on the Protection and Reuse Model of Historical Buildings in Chinese Airports

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Abstract—China had constructed a large number of military and civilian airports before and after World War II, and then began large-scale repairs, reconstructions or relocation of airports after the baptism of wars after World War I and World War II. The airport's historical area and its historical buildings such as terminals, hangars, and towers have adopted different protection strategies and reuse application strategies. This paper is based on the judgment of the value of airport historical buildings to study different protection and reuse strategies. The protection and reuse models of historical buildings are classified in three dimensions: the airport historical area, the airport historical building complex and its individual buildings, and combined with specific examples to discuss and summarize the technical characteristics, protection strategies and successful experiences of different modes of protection and reuse of historical areas and historical buildings of airports.

Keywords—Airport, airport area, historic airport building, protection, reuse model.

I. INTRODUCTION

AIRPORT architecture is a kind of professional architecture of air transportation in traffic architecture category. The architectural space distribution is relatively independent, the building type is of professional character, and the architectural attributes are both military and civilian. Airport areas with a long history are generally large-scale "industrial architectural heritages" integrating historical areas and historical buildings, whose remaining historic buildings are generally of historical cultural value and scientific and technological value. This article aims to explore the protection and reuse models and strategies of domestic airport architectural heritages for reference.

II. THE STATUS QUO OF REMAINS AND PROTECTION OF HISTORIC BUILDINGS IN CHINA

As a newly-emerging type of traffic architecture in the early modern stage, airport architecture can be described as a relatively independent minor type in the history of the early modern Chinese architecture. Since the airport is a military facility that has been repeatedly scrambled and destroyed during the wars in the early modern China, many early modern airport buildings have been destroyed during the frequent wars. There are very few physical relics of the early modern airport buildings left today, which are merely scattered in Shanghai

Longhua, Guangzhou Baiyun, Nanjing Daxiaochang and Kunming Wujiaaba old airport areas, etc. Most of these existing airport's historic buildings have strong historical, cultural and architectural value, as well as distinctive industry value. Due to the abandonment of airport functions and urban expansion, the early modern airport buildings of these inner-city airports that survived the wars are in a state of disrepair and decay, with no effective repair or maintenance. However, most of them are even at risk of being demolished in peacetime.

Through the analysis of the current status of the preservation and reuse of the airport historical buildings in China, it can be found that there are following three prominent problems: The first is insufficient attention. Some airport historical building remains are not included in the protection list because their location is remote or their protection value system is usually ignored. Even if the remains of airport buildings included in the conservation list are protected in isolation, which not only lost the original airport style, they also are separated from the surrounding environment. The second is inadequate protection. The current protection and reuse methods of old airports areas are relatively simple and focus on large-scale real estate development in a way of flattening and rebuilding. This development method can quickly recover funds for the government. However, it basically erases the airport mark and the over-commercial development way also cuts off the aviation vein. The third is the lack of theoretical and systematic monographic study, and typical application examples. Compared with the rich experience of airport buildings protection of European and American countries, the research on the protection and reuse of historic airport buildings in China is still in the exploratory stage, and a systematic theory has not yet been formed. Meanwhile, relevant policy systems are required. Seeking a balance between economic benefits of land development in the old airport areas and inheritance of the aviation context is still a difficult problem to be solved urgently.

III. THE PROTECTION AND REUSE MODELS OF AIRPORT HISTORIC BUILDINGS IN CHINA

A. The Protection and Reuse Model of the Airport Historical Area

This mode refers to a large-scale overall protection approach to the entire airport historical area. It means that the large open space pattern, specific spatial mechanism of airport plots and the main airport historic building remains are preserved to the greatest extent. And it needs to adopt multi-functional comprehensive development. The activation and utilization of individual buildings in the historical area of the airport should







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be combined with the redevelopment of the area, and the protection and reuse of the area should be organically connected with the urban design. The advantage of the overall protection and reuse of the area is that it can fully protect the original mechanism and structure of the entire airport, so as to better inherit the historical cultural value and social value of the

area. The airport area generally has the characteristics of obvious location advantage, large scale of occupation, flat terrain, etc. Therefore, the overall protection is difficult to achieve. Berlin Tempelhof Airport in Germany is the only one that implemented the overall protection of the airport area at home and abroad.

TABLE I
THE CURRENT SITUATION OF TYPICAL MODERN AIRPORT BUILDINGS IN CHINA

Architectural Heritage (Completed Year)	Using Status	Current State	Conservation Status
Terminal of Guangzhou Baiyun Airport (1947)	office building		Structurally impaired
Terminal of Shanghai Longhua Airport (1947)	library (planned)		excellent historical building in Shanghai
Terminal of Hami Airport (1939)	history exhibition hall		key cultural relics protection units in Xinjiang Province
Hangar of Luoyang Jingyuan Airport (1934)	real estate development		demolished
Hangar of Nanchang Qingyunpu Airport (1935)	plant building		unprotected
Hangar of Nanjing Ming Palace Airport (1940s)	1940s		historical building in Nanjing

The common practice is to build a pleasant large public green space based on the original runway system, and the theme function of runway park is also commonly used. The runway park is used as the axis to connect the scattered historical buildings of the airport, which can guide the reshaping of the urban spatial structure of the entire airport area and surrounding area. Shanghai Longhua Airport, founded in 1922, is one of the birthplaces of China's civil aviation. Due to the impact of constraining factors such as air clearance, aviation noise and land use, the aviation function of the airport has gradually degraded. The airport was used to be an amphibious airport at first, then evolved into a land airport, and then became a general airport, until it was finally downgraded to a helicopter landing site in 2018. The entire airport plot has been incorporated into the Xuhui Riverside Development Plan based on the design concept of "Shanghai CORNICHE" (Beach Avenue). Longhua Airport and the cement factory are just one of the nodes to jointly create the "West Bund Art and Culture Belt". Among them, the original runway has been transformed into "Yunjin Road Runway Park", the helicopter hangar has been transformed into "Yudeyao Art Museum", and the aviation tank has been built into the "West Bund Oil Tank Art Center". And the terminal will also be built into the "West Bund library".

B. The Protection and Reuse Model of Historic Airport Building Complex

This model is a method for preserving the professional airport building complex with specific aviation functions and relatively concentrated layout as a whole to create a historic district with the theme of aviation culture. It continues the original aviation historical context of the airport and intensively shows the internal spatial evolution mechanism of the original architectural complex, whose overall historical and cultural value is often higher than the sum of the values of individual buildings. Building complex can be redeveloped into a series of diversified buildings centering on specific aviation themes. In particular, the available sufficient space of the airside can be used to continue civil aviation functions, such as small business aviation bases or the theme museums, which can greatly decrease the cost of renovation and fully retain the original architectural features of the airport.

We take Nanjing Ming Palace Airport built in 1927 as an example, which was one of the earliest airports in early modern China to set up military aviation, civil aviation, aviation industry and aviation education. The airport remains contain a complete collection of modern airport buildings with diversified aviation functions. On both sides of the existing Hangkong road, there are early modern and modern air transportation buildings on the west side, and modern aviation industry buildings on the east side clearly. On the west side, historical and cultural building complex with the theme of air transport is formed, among which the airport buildings are aircraft hangar series, maintenance workshops, aviation stations and towers which was built in the planned economy period in order from north to south. The building complex reflects the development of modern air transportation. On the east side, historical and cultural building complex with the

theme of aviation industry shows achievements of the aviation industry of the People's Republic of China. Therefore, we can build a cross-shaped aviation cultural historical block made up of the east-west Jincheng Road and the north-south Hangkong road, which can relatively completely display the aviation context of early modern and modern historical blocks and form a strong location sense [1]-[2].

C. The Protection and Reuse Model of Single Historic Building in the Airport

Different from the overall protection model of the airport historic area and the airport historic complex, the protection and reuse model of single historic building is a method for independent protection and reuse of individual historic buildings in the airport. This model is suitable for airports with a small number of historic buildings with high value. Its designated protection scope is limited, which requires little capital investment and does not affect the overall development plan of the surrounding area. The typical professional buildings of the airport involved in this mode are mainly divided into three categories: terminal, hangar and tower. Among them, the terminal has the characteristics of wide and unblocked peripheral vision, good ventilation and lighting effect, convenient transportation, sufficient parking space, and easy-to-renovate surrounding landscape. Therefore, it is usually transformed into office building, library and museum. Hangar is generally suitable to be changed into art gallery, exhibition hall, creative industrial park and sports center due to their spacious interior space, large span, strong structure, long service life and strong spatial plasticity. The tower is usually the tallest airport building with high recognition and unique shape. In the early stage, it was mostly attached to the terminal building and is generally suitable for transformation into a sightseeing platform.

We take Terminal 2 of Xiamen Gaoqi Airport built in the early 1990s, as an example. With the opening of the new terminal, it was disabled and idle. In 2018, this small two-story terminal was transformed into the first Red Dot museum in China by the joint efforts of German Red Dot Design Award Organization and Xiamen Media Group. With an area of nearly 10,000 square meters, it has realized the organic fusion of innovative design culture and advanced aviation culture. Corresponding to the T3 terminal with unique Chinese Fujian and Taiwan maritime cultural characteristics, it is connected with the surrounding art museums and art centers, jointly promoting the re-upgrading of the cultural and creative industry in the Xiamen airport area.



Fig. 1 Status of Terminal 2 at Xiamen Gaoqi Airport before and after reuse development

IV. THE PROTECTION AND REUSE STRATEGIES OF AIRPORT HISTORIC BUILDINGS IN CHINA

A. Establish a Systematic Policy Regime for the Protection of Airport Historic Buildings

To integrate the protection of airport historical buildings into the classified and graded protection system of historical buildings, it is necessary to recognize the comprehensive value of all modern airport buildings in the airport area one by one at first. Then we should give classified and graded protection to all of them, and give overall protection to the modern airport historical buildings with different attributes and different regions. Meanwhile, we should actively apply for the national or provincial historical building or industrial heritage list for them. According to actual conditions of different airports, relevant departments should formulate specific plans for the protection of modern airport historical buildings and conduct special exchange and discussion programs, so as to fully excavate the historical value and be in tune with the planning of the area [3]-[5].

B. Promote the Organic Integration of Airport Area Redevelopment and Urban Renewal

The overall planning of the airport area should start from integrating into the overall framework of urban land planning, and its functional orientation should fit in with the development orientation of the city. Not only should it be developed as a whole, but also attention should be paid to the integration with the existing urban texture, land functions and coordination industrial structure. We can make full use of the open space in the airport area create green open public space, which can be used for large-scale public construction projects. By combining the original functions of land, the land parcels are reasonably divided and orderly combined. And it also realizes the diversification of the land use function layout. This is an opportunity to transform the original empty airport area into part of the natural growth of a city. In this process, city functions are optimized and city image is improved [6]-[8].

C. Adopt Flexible Protection Methods and Diversified Funding Sources

Due to the differences in construction technology characteristics and value systems, the focuses of the protection and reuse methods for airport historic buildings are different. So the protection and reuse methods for airport historic buildings should be adapted to local conditions and diversified. For instance, transforming the historical heritage of the airport into a museum can greatly save the cost of reconstruction, continue the architectural style, and inherit the historical context. While transforming the airport buildings into commercial centers, hotels, and entertainment centers can protect the original historical buildings and create higher economic or social value at the same time. In addition, because of the relatively high cost of protecting airport historic buildings, funds for the conservation of historic airport buildings can not only be from government grants, but also come from individual or corporate donations, special funds, bank loans and so on.

V. CONCLUSION

The protection and reuse of airport historic buildings in China is an emerging research and application field of industrial heritage protection and utilization. This field has the characteristics of strong professionalism, wide coverage, great difficulty in protection, and high security requirements. It is necessary to extensively learn from the experience and lessons of the renovation and reuse cases of historical airport buildings at home and abroad, make a comprehensive evaluation of the inherent value system of airport historic buildings in China, then analyze the advantages, disadvantages and applicability of various protection and reuse modes applied, and finally provide the best implementation scheme for the protection and reuse of airport historical buildings, so as to meet the dual objectives of continuing the aviation context of airports context and modern aviation functional requirements.

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