Research on Aviation Logistics Development Planning of Zhengzhou Xinzheng International Airport

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Abstract

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With the development of China's science and technology and economy, various fields in China are developing rapidly. Among them, the development of cross-border e-commerce has led to the fragmentation of trade. The former large-scale goods are developing towards the trend of multi-variety, multi-frequency and small-batch, which promotes the development of the aviation express goods market. The development speed of aviation logistics is accelerating. As an important node in the aviation logistics network, the status of the airport is becoming more and more important. For a long time, Zhengzhou Xinzheng Airport, by virtue of its own advantages, timely grasps the good opportunity of the great development of the logistics industry and has made remarkable achievements in the aspects of business volume increase and business structure optimization.

This paper starts from the concept and connotation of aviation logistics and its main facilities, studies its development process, and determines the necessity and feasibility of the development of aviation logistics at Zhengzhou Xinzheng International Airport by analyzing the development trend and political background of Chinese aviation logistics, combined with the geographical advantages of Zhengzhou. According to the historical data of previous years, the grey prediction model method is adopted to predict the future air cargo throughput, and then the advantages and disadvantages of aviation logistics development of Zhengzhou Xinzheng International Airport are discussed through PEST and SWOT model analysis, and suggestions on aviation logistics development planning of Xinzheng International Airport are given.

Keywords
Zhengzhou Xinzheng International Airport；aviation logistics；freight throughput forecast；development proposal

Table of contents

1. Introduction

This chapter mainly tells the general content of this paper, from the research background to the purpose and significance, so that readers can understand the author's writing thought process, and analyzes the status quo of aviation logistics at home and abroad.

1.1. Research background

Air cargo is an important part of modern logistics, which provides safe, fast, convenient and quality service. Airports with high efficiency and comprehensive cargo services will play an important role in reducing production and operating costs, improving product quality, protecting the ecological environment and accelerating commodity turnover.

With the continuous development of our economy, more and more enterprises are aware of the importance and unique advantages of air freight logistics. More enterprises cannot develop without air freight logistics. Therefore, the market scale of air freight material resources is gradually increasing. According to statistics, Chinese cargo airports take a large proportion in the whole Asia cargo airports, and Hong Kong International Airport is the world's largest cargo transportation.

2023 is the first year to fully implement the Party's 20 spirit, is the key year to implement the "14th Five-Year Plan", fully open the new journey of Chinese-style modernization, Chinese logistics personnel, shoulder the responsibility. As an important part of the modern circulation system, aviation logistics plays an important role in unblocking the domestic and international double circulation, stabilizing the industrial chain and supply chain, and ensuring the national economic security.

In 2013, The State Council approved Zhengzhou Airport Economic Comprehensive Pilot Zone, which started the construction of the first national airport economic demonstration zone. Taking this opportunity, Xinzheng Airport gives full play to the driving and leading role of aviation logistics in regional economic development, vigorously develops the aviation logistics industry, and builds an international aviation logistics center. In domestic and international air cargo hub competition advantages gradually highlighted. In 2020, against the background of the severe impact of the novel coronavirus epidemic on the civil aviation industry, the air cargo of Xinzheng Airport grew rapidly, with the cargo throughput reaching 639,400 tons, a year-on-year growth rate of 22.49%, ranking the first among major airports in China, and the cargo ranking ranking 6th in China.

1.2. Research purpose and significance

This section mainly describes the research purpose and significance of this paper, so that readers can clearly understand the author's writing purpose and the benefits of this paper.

1.2.1. Research purpose

With the rapid development of the logistics industry, air logistics has played a very important role. Global economic integration, sustained growth of economic and trade, adjustment of industrial structure, deepening of the reform of Chinese civil aviation economy and management system, etc., has created a good environment for the development of Chinese air logistics. In 2022, the Civil Aviation Administration issued the 14th Five-Year Plan for the Development of Aviation Logistics. This is the first time that CAAC has formulated a special plan for the development of aviation logistics, which will provide precise guidance for building a high-quality, efficient, independent and controllable aviation logistics system. China's air cargo is in a period of strong growth, and the volume is also increasing. Aviation logistics is an important force supporting the development of modern logistics industry. At the same time, it relies on airports to carry out long-distance freight, which has great advantages in promoting the development of international logistics industry. The prosperity of aviation logistics industry stimulates the formation of distinctive and dynamic areas around the airport, continuously attracts related industries and drives the development of airport economy. In 2018, the Civil Aviation Administration of China and Henan Provincial Government jointly issued the Strategic Plan of Zhengzhou International Air Cargo Hub, which comprehensively sorted out and systematically guided the whole chain and elements of the hub construction. According to the Plan, Zhengzhou Xinzheng International Airport constantly explores new modes such as intelligent logistics, multimodal transport and regional and port linkage, vigorously cultivates market players, introduces upstream and downstream aviation logistics enterprises such as airlines, freight forwarding enterprises and large logistics integrators, and actively introduces emerging business forms such as express mail, cross-border e-commerce and fresh cold chain. Drive aviation oriented industry chain, cluster landing development. In this context, it is necessary to build an aviation logistics park covering the Central Plains, serving the whole country, contacting the world and having strong mobility ability.

At present, our country is constructing a new development pattern with domestic great cycle as the main body and domestic and international cycle promoting each other. Aviation hub has become an important node of domestic great cycle and strategic link of domestic and international cycle. With the rapid development of aviation logistics industry in Xinzheng Airport, it is also faced with many internal and external factors restricting its development, so it is urgent to formulate relevant development strategies. Based on the vigorous aviation market and unique geographical advantages of Zhengzhou Xinzheng Airport, it is necessary to deeply study the strategic positioning and development ideas of aviation logistics business of Zhengzhou Xinzheng Airport under the new situation, and grasp the development trend and historical opportunities. The main issues to be studied in

this paper are to improve the quality, service ability and efficiency of aviation logistics business of Xinzheng Airport, enhance its comprehensive competitiveness, propose corresponding plans, objectives and implementation strategies for the development of aviation logistics of Xinzheng Airport, so as to promote the sustainable and healthy development of aviation logistics of Xinzheng Airport.

According to the actual logistics development of Zhengzhou Xinzheng Airport, combined with relevant strategic research methods and other management theories, the main research is as follows:

1. Starting from the concept and connotation of aviation logistics and its main facilities, this paper studies its development process, analyzes the development trend and political background of China's aviation logistics, and combines the geographical advantages of Zhengzhou to determine the necessity and feasibility of studying the development of aviation logistics at Zhengzhou Xinzheng International Airport.

2. Forecast the future air cargo throughput of Zhengzhou Xinzheng International Airport by combining the grey prediction model according to the historical data of previous years, and then mastered the development of air logistics in all aspects through PEST and SWOT model analysis.

3. Based on the above research and analysis, the advantages and disadvantages of aviation logistics development of Zhengzhou Xinzheng International Airport are discussed, and suggestions on aviation logistics development planning of Xinzheng International Airport are given

1.2.2. Research significance

(1) Promote the development of aviation logistics with the help of regional and policy dividends

Henan Province is located in the hinterland of Central Plains, with obvious geographical advantages and developed transportation industry. The airport economic industry represented by the development of aviation logistics will become a new source of economic development of Henan Province in the future. Under the background of building a national comprehensive three-dimensional transportation network and a new development pattern of double circulation, Xinzheng Airport should continue to expand its air cargo fleet and route network, deepen the application of air logistics informatization, keep up with new air cargo modes and business forms such as cold chain logistics and cross-border e-commerce, build a multimodal transport system, and improve the talent introduction, training and certification system of air logistics. To comprehensively enhance the advantages of Xinzheng Airport as an air cargo hub airport, help Xinzheng Airport build itself into an international air cargo hub connecting both domestic and overseas and

radiating to the world, and drive Henan Province to integrate into the global economic cycle as a strategic platform.

(2) In-depth analysis of Zhengzhou Xinzheng International Airport to build a more advanced aviation logistics park

Based on the actual situation of aviation logistics of Zhengzhou Xinzheng International Airport, this paper analyzes the current cargo throughput and development situation, uses data to predict the growth trend of logistics throughput in the next ten years, analyzes the advantages and disadvantages of Xinzheng International Airport, and puts forward planning suggestions suitable for its own aviation logistics development, so as to promote the faster and better development of Zhengzhou Xinzheng International Airport. At the same time, studying the development of aviation logistics in Xinzheng Airport can improve the understanding of aviation logistics, attach importance to the development of aviation logistics in the airport, clarify the future development direction of aviation logistics, and help the construction of international aviation hub airport. Therefore, choosing aviation logistics in Zhengzhou Xinzheng Airport as the topic direction not only discusses the practical significance of the rise of aviation logistics industry in Central Plains. It also has theoretical significance to guide the development of airport aviation logistics in the future

1.3. Research status at home and abroad

This section mainly describes the research status at home and abroad, and clearly explains the current development research of aviation logistics.

1.3.1. Domestic research status

Fan Aihua, Zhu Junhong, Liming（2022） studied the development status and scale of aviation logistics in Zhengzhou Xinzheng Airport, pointed out existing problems and put forward suggestions for improvement, and concluded the future development direction of aviation logistics in Henan Province.

Yao Jinru and Yan Juan（2022） studied the current situation of air cargo and mail throughput in Hainan, made a detailed analysis of the development of air logistics in Hainan from various aspects, predicted the air cargo and mail throughput in Hainan in 2025, put forward solutions for growth, and put forward suggestions for the future development direction of air logistics in Hainan.

Zhu Zixiang （2021） took Kunming Changshui International Airport as the research object, analyzed its air cargo on the basis of data, and gave suggestions for future planning.

Li Jiao （2020） studied Shenzhen Airport, made a comprehensive analysis of it, including SWOT, PEST and Porter's five forces model, explored the advantages and disadvantages of Shenzhen Airport and put forward suggestions for its development.

Taking the new development pattern as the background,

Zou Jianjun （2022） analyzed the current domestic situation and put forward the key tasks for the development of aviation logistics in the future, which should focus on improving the infrastructure of aviation logistics, improving the service system of aviation logistics and creating a good development environment.

Lv Hongwei （2022） believes that the development of contemporary aviation logistics needs to be optimized and reformed from multiple perspectives, make full use of the collaboration effect of various modes of transport, and develop means to adapt to the current new technology to ensure the rapid development of aviation logistics.

Chen Wenjing（2021） studied the development status of aviation logistics in Zhengzhou Airport, analyzed the data analysis, related enterprises and transportation routes, explained the existing problems of aviation logistics in Zhengzhou Airport, and made suggestions for its development direction.

Huang Wenbo, Chen Zisho（2021） analyzed the development status of China's aviation logistics from the characteristics of aviation logistics, predicted its development trend, and then proposed the existing problems of China's aviation logistics development and proposed solutions one by one.

Zhang Gan（2020） believes that aviation logistics parks should be planned in advance to cope with future development, and diversified investment and financing methods should be used to reduce the park.In addition, the intelligent logistics park is also an indispensable foundation for the future development. The customs clearance efficiency of the park should be improved to solve the problems caused by the delay.

Zhu Yu(2015) combined with the analysis of the main functions, main processes and characteristics of air cargo terminal, and when the boundary conditions such as cargo handling capacity, cargo type and function composition were determined, he analyzed the main factors affecting the overall process layout, so as to find out the key points of the overall process layout design of air cargo terminal

Li Peng (2017) studied the business model and cargo infrastructure of Frankfurt Airport and concluded the reasons for the success of the air cargo hub of Frankfurt Airport.

Yu Jiaxi （2018） studied the management experience of aviation logistics in major large airports in Europe and Asia, combined with China's actual situation, and drew specific suggestions for the development of aviation logistics in China.

Tang Rongzhu (2015） believes that there are still many problems in aviation logistics of Zhengzhou Xinzheng International Airport, such as imperfect infrastructure and lack of

professional talents, and proposes countermeasures according to the development of domestic aviation logistics to help Zhengzhou Xinzheng International Airport build more perfect aviation logistics.

Sui Xiuyong and Liu Lianghao （2022） studied the current situation of Chinese air cargo and pointed out the challenges and opportunities it encountered, and took SF Airlines as the research object to analyze its advantages and outstanding places for other enterprises to study.

1.3.2. Foreign research status

Nie Z, Duan D, Yao J （2018） believe that the systematic layout design method should be adopted to plan the urban airport logistics park, and by comparing the existing logistics parks at home and abroad, the quantitative analysis method is adopted to put forward suggestions.

Yan L, Guo X, Ding W. （2009） studied the planning and design technology of ALP to meet the needs of aviation logistics.

Petruf M, Korba P, J Kolesar. （2015） believed that airports should apply CDM system in the development of aviation logistics, which could not only optimize the airport system, but also improve the efficiency of aviation logistics.

Jiang C, Bai L, Zheng W. （2010） took Ningbo Airport Logistics Park as an example, studied the layout facility planning of different methods, gave an example, and finally concluded that the logistics park should be selected according to its own characteristics.

Lei W. （2015） believed that e-commerce and logistics influenced each other, analyzed logistics distribution center based on performance appraisal, and finally gave suggestions for improvement.

1.4. Research method

Literature research and survey research method.To inquire and understand the relevant research and literature on the development history and current situation of domestic and foreign aviation logistics, so as to comprehensively and correctly understand and master the issues to be studied. Communicated with Zhengzhou Xinzheng International Airport Cargo Company on internal demand data, searched for relevant planning schemes on the official website of Zhengzhou Airport Economic Zone, and put forward the theoretical system of aviation logistics development of Xinzheng Airport.

Quantitative analysis. Analyze and select the appropriate logistics throughput prediction model, make scientific and reasonable prediction of the future air cargo throughput of Xinzheng Airport, through quantitative analysis, the understanding of the problems in the

development of air logistics of Zhengzhou Xinzheng Airport becomes more accurate, use real data to reveal the corresponding law, start from the essence, after clarifying the relationship, predict the development trend of air logistics of Xinzheng Airport. The future planning of aviation logistics is analyzed based on the development of aviation logistics and related theories.

1.5. Research content

This paper starts from the concept and connotation of aviation logistics and its main facilities, studies its development process, and determines the necessity and feasibility of the development of aviation logistics at Zhengzhou Xinzheng International Airport by analyzing the development trend and political background of Chinese aviation logistics, combined with the geographical advantages of Zhengzhou. The main research work and framework of this paper include:

Part I: Introduction. This paper mainly introduces the research background, significance, research status, research methods and content of aviation logistics at home and abroad. Based on the research background and significance, this paper summarizes the existing domestic and foreign aviation logistics research situation and literature, and gives the research content and methods.

Part two: Aviation logistics demand analysis of Xinzheng International Airport. Firstly, the general situation of Zhengzhou Xinzheng International Airport is introduced, and then the cargo throughput is forecasted by grey prediction method. Related theories of aviation logistics, demand analysis and strategic analysis: Through text description, the relevant theories of aviation logistics and aviation logistics operation are elaborated, and then the relevant theories of data analysis and strategic analysis used in this paper are elaborated. By introducing the development situation of aviation logistics at home and abroad and at Zhengzhou Xinzheng International Airport, this paper obtains the forecast ideas and methods of cargo throughput, selects the appropriate pre-model, and predicts the throughput of aviation logistics from 2020 to 2030 according to the real data of Zhengzhou Xinzheng International Airport in previous years.

Part three: In-depth analysis of aviation logistics at Xinzheng International Airport. This part mainly carries out PEST and SWOT analysis on the development of aviation logistics in Zhengzhou Xinzheng International Airport. PEST analysis and SWOT analysis are used to analyze opportunities, threats, strengths and weaknesses in the external environment and development of Zhengzhou Xinzheng International Airport to determine strategic priorities.

Part 4: Solving the problem and giving advice. According to the context, the paper gives planning suggestions for the throughput prediction and internal and external analysis of aviation logistics of Zhengzhou Xinzheng International Airport.

The fifth part: Summary. The paper summarizes the whole paper, puts forward the prospect of the difficulties encountered in the research process, and puts forward the opinions on the problems studied.

2 Description of use method

This chapter mainly describes the methods used in this paper, including PEST analysis, SWOT analysis and grey prediction model, which are explained in detail.

2.1 PEST analysis theory

PEST analysis is a method used to help enterprises review their external macro environment. PEST analysis is relatively simple and refers to the analysis of the macro environment. The macro environment, also known as the general environment, refers to various macro forces affecting all industries and enterprises. When analyzing macro-environmental factors, different industries or enterprises have different characteristics, so the specific content of the analysis will be different. But generally from the Political (Political), Economic (Economic), Social (Social) and technology (Technological) four aspects to analyze the external environmental factors of enterprises. PEST tool can effectively analyze the growth or decline of the market, the environment of the enterprise, its potential and the direction of operation.

Among the four factors, political factors include trade restrictions, tariffs, labor laws, environmental controls, etc. Economic factors include economic growth rate, interest rate, exchange rate and inflation rate. Social factors include cultural views, population growth rate, age structure and so on. Scientific and technological factors focus on R&D activities, technological inducements and the speed of technological development. Opportunities and threats in SWOT analysis can be summarized by combining PEST analysis with factors of the overall external environment.

2.2 SWOT analysis theory

SWOT analysis can analyze the environment and conditions of the analysis object, clarify its development trend, point out the advantages and disadvantages of the analysis object through current situation analysis, and clarify its good conditions and challenges, so as to provide important decision-making basis for its future development. The capital letters in SWOT are abbreviations of different English words, respectively representing different meanings. S and W respectively represent the strengths and weaknesses of the enterprise's internal environment, and O and T respectively represent the opportunities and challenges of the enterprise's external environment. This paper uses this model to comprehensively analyze the internal and external environment of Zhengzhou Xinzheng International Airport, find out the advantages and disadvantages in its development process, and identify the opportunities and threats it faces.

2.3 Grey prediction model

The system is a whole formed by mutual restriction and interrelation between things and factors in the continuous development and change of the objective world. According to the different connotation of things, the establishment of social system, economic system, engineering technology, etc. People try to analyze the characteristics of various systems, so as to understand the operating mechanism of the system. From the point of view of the completeness of information and the construction of model, the engineering technology system has sufficient information, its development and change have obvious rules, can be described quantitatively, but also has specific structure and parameters, we call it white system. For another type of system, such as ecosystem, agricultural system and social system, we cannot establish objective physical prototype, its principle of action is not clear, internal factors are difficult to identify or the relationship between hidden, it is difficult for people to accurately understand the behavior characteristics of this type of system, so it is difficult to describe it quantitatively, which brings difficulties in building models. Such systems whose internal characteristics are partially known are called grey systems.

"Grey" means that the information (the relationship between factors) is not completely ambiguous, the sample is small,The research object of grey prediction model is grey system, which is a generalization of black box concept. We call a system that contains both known and unknown information a grey system. As the two extremes, we'll call a system where the information is completely uncertain a black system; A system with complete information certainty is called a white system.

Grey system theory defines grey differential equations and grey derivatives based on concepts such as smooth discrete function and correlation space, and uses discrete data sequences to establish dynamic models in the form of differential equations. This is the basic Model of intrinsic grey system, and the model is not unique and approximate, so this model is called grey model, denoted as GM(Grey Model). That is, gray model is a differential equation form model established by using the generation of discrete random numbers into the generated numbers with significantly weakened randomness and relatively regular, so as to facilitate the study and description of its change process.

3 Airport profile

This chapter mainly introduces the main body of this paper - Zhengzhou Xinzheng International Airport, first introduces the airport itself, and then introduces the current development of airport aviation logistics, so that readers have a deeper understanding of the whole paper.

3.1 Development overview of Zhengzhou Xinzheng International Airport

Zhengzhou Xinzheng International Airport (IATA code :CGO; ICAO Code :ZHCC, referred to as Xinzheng Airport), is a large civil airport in Zhengzhou, Henan Province in China, one of the eight aviation hub ports in China determined by the Civil Aviation Administration of China, and the Asia-Pacific headquarters of Luxembourg Cargo Air, the largest all-cargo airline in Europe. The airport was established on August 28, 1997, in accordance with the international standard design, flight class of 4F, completed in 1997, is one of the busiest civil airports in Central China, the most important civil airport in Henan Province and the base airport of Henan Branch of China Southern Airlines. It is also China's domestic trunk transport airport and national first-class air port. Zhengzhou Xinzheng International Airport, as the air gateway of Henan Province and one of the important domestic aviation ports, undertakes most of the air transport tasks in Henan Province, and the transport scale accounts for more than 96% of the province's civil aviation transport.

At present, 37 airlines including Henan Branch of China Southern Airlines and other base companies operate in the airport, among which 23 passenger airlines have opened 185 passenger routes, including 15 international and regional passenger routes. There are 14 cargo airlines and 23 cargo routes, including 19 international cargo routes. The number of passenger and freight cities has reached 83, basically forming a air route network covering the whole country and major cities in Southeast Asia and connecting freight hubs in Europe and the United States. It is planned to be an international air cargo hub and a comprehensive domestic aviation hub.

3.2 Analysis of aviation logistics development status of Zhengzhou Xinzheng International Airport

Xinzheng Airport is located in the southeast of Zhengzhou City, 25 kilometers away from the urban area. It was completed in 1997, and its flight zone is rated 4E. The total length of the runway is about 3400 meters, which can guarantee the loading and landing of the world's largest aircraft A380. Its comprehensive transfer center (GTC), which is currently under construction, can realize zero transfer of passenger and seamless connection of freight between high-speed rail, intercity rail, subway and expressway. Xinzheng Airport is

a first-class air port in China. At present, there are 6 air cargo companies stationed in the airport, with 24 cargo routes, and the cargo can reach 76 cities directly, among which 22 are international cities, covering Europe, Middle East, South Asia, Africa and other parts of the world except South America. The comprehensive transportation network extending in all directions provides convenience for the cargo source to gather in Xinzheng Airport. Moreover, Xinzheng Airport is located in a non-urban area, which has advantages such as low land cost and abundant and cheap labor resources. Its freight throughput has been growing first in China for three consecutive years. Foxconn, UPS of the United States, Airbridge of Russia and other enterprises have settled in the airport. A number of projects involving automobile manufacturing and maintenance, mobile phone manufacturing, electronic information and other aviation logistics related industries such as Alibaba E-Trade Commodity Distribution Center, Greenland Convention and Exhibition City, Taiwan Youjia Precision Machinery Park have signed contracts with the airport. The pilot operation of cross-border E-trade has provided strong support for aviation logistics. A number of electronic information, biomedicine and other enterprises have gathered near Xinzheng Airport. Xinzheng Airport has opened a direct cargo flight route from Zhengzhou to Luxembourg, building a "dual hub" with Zhengzhou as the logistics center of Asia Pacific and Luxembourg as the logistics center of Europe and the United States, attracting the collection and distribution of domestic and foreign goods in Zhengzhou.

4 Analysis and Results

This chapter is the core of this paper. According to the author's understanding and exploration of aviation logistics in Xinzheng International Airport, PEST analysis and SWOT analysis are carried out to put forward the author's own opinions and suggestions. And the air cargo volume of gray forecast, so that better for more and more cargo volume recommendations.

4.1 PEST analysis

Political factor: On March 7, 2013, The State Council approved the Development Plan of Zhengzhou Airport Economic Comprehensive Experiment Zone (2013-2025), and Zhengzhou Airport Economic Comprehensive Experiment Zone was officially established, becoming the first and the only state-level aviation economic development pilot zone approved and established by The State Council.

And it is strongly supported by the Henan provincial government. The provincial government has successively issued the 13th Five-Year Development Plan of Zhengzhou Airport Economic Comprehensive Experimental Zone, the Special Plan for the Construction of Zhengzhou - Luxembourg "Air Silk Road" (2017-2025), the Work Plan for Promoting the Construction of Zhengzhou - Luxembourg "Air Silk Road", and the 14th Five-Year Aviation Economic Development Plan of Henan Province. The provincial government and the Civil Aviation Administration jointly issued the Strategic Plan of Zhengzhou International Air Cargo Hub, the Civil Aviation Administration approved the Master Plan of Zhengzhou Xinzheng International Airport (2021 Version), and the Pilot Airport Zone formulated the 14th Five-Year Development Plan and the Outline of the Long-range Goals for 2035 of Zhengzhou Airport Economic Comprehensive Experimental Zone. It provides a strong guarantee for the development and construction of the airport experimental area. In recent years, the Henan Provincial government has been planning for the future with a 30-year strategic vision, reviewing the strategic planning of the airport pilot area, promoting the further development of the core area, interaction area and synergy area, and promoting the "dual core" of the airport pilot area and the main city of Zhengzhou to drive the integration of Zhengbian Prefecture, Central Plains Economic Zone and Zhengzhou metropolitan area.

Economic factor: Over the past 40 years of reform and opening up, Henan has made brilliant achievements in economic and social development. However, with the rapid growth of economic aggregate, Henan is confronted with the urgent requirements and severe challenges of promoting the strategic adjustment of economic structure,

accelerating the transformation of economic development pattern and realizing the transformation of economic and social development, just like the whole country.

In the past decade, the pilot airport zone where Zhengzhou Xinzheng International Airport is located has maintained a high economic growth rate, with the GDP growing from 20.6 billion yuan to 120.8 billion yuan, an average annual growth rate of 14.1%, nearly 7 percentage points higher than the provincial average. The total industrial output value increased from 125.2 billion yuan to 535.84 billion yuan, an average annual growth of 17.2%; The import and export of foreign trade increased from 175.9 billion yuan to 470.78 billion yuan, with an average annual growth rate of 11.1%, with the peak reaching 524.6 billion yuan in 2021. In 2022, the regional GDP of Zhengzhou Airport reached 120.8 billion yuan, with an average growth rate of 14.1% in 10 years. Import and export of foreign trade has reached 470 billion yuan, accounting for "half of the total import and export of Henan Province".

Social factor: Population is the core resource to promote economic and social development. Population scale is the embodiment of urban agglomeration and radiation ability, and also a major basis for urban competition. Zhengzhou announces population data for 2022. Statistics show that the total number of permanent residents in Zhengzhou increased to 12.828 million in 2022,

Zhengzhou is a city with net population inflow, and the total number of permanent residents keeps growing. By the end of 2022, the permanent population of Zhengzhou was 12.828 million, an increase of 86,000 over the end of 2021. From the perspective of population age structure, the population between 0 and 15 years old is 2,466 million, the population between 16 and 59 years old is 8,664 million, and the population aged 60 and above is 1,698 million. The growing population indicates that Zhengzhou is moving closer to advanced cities, and this has a positive effect on the development of air logistics at Zhengzhou Xinzheng International Airport.

Scientific and technological factors:Zhengzhou Airport Pilot Zone is home to many science and technology industries, and the comprehensive transportation network in all directions facilitates the agglomeration of cargo sources to Xinzheng Airport. Moreover, Xinzheng Airport is located in a non-urban area, which has advantages such as low land cost and abundant and cheap labor resources. Foxconn, UPS of the United States, Airbridge of Russia and other enterprises have settled in the airport. A number of projects involving automobile manufacturing and maintenance, mobile phone manufacturing, electronic information and other aviation logistics related industries such as Alibaba E-Trade Commodity Distribution Center, Greenland Convention and Exhibition City, Taiwan Youjia

Precision Machinery Park have signed contracts with the airport. The pilot operation of cross-border E-trade has provided strong support for aviation logistics. A number of electronic information, biomedicine and other enterprises have gathered near Xinzheng Airport. Xinzheng Airport has opened a direct cargo flight route from Zhengzhou to Luxembourg, building a "dual hub" with Zhengzhou as the logistics center of Asia Pacific and Luxembourg as the logistics center of Europe and the United States, attracting the collection and distribution of domestic and foreign goods in Zhengzhou.

4.2 SWOT analysis

This section mainly analyzes the SWOT of Zhengzhou Xinzheng International Airport from four aspects: opportunities, threats, strengths and weaknesses.

4.2.1 Opportunity

（1）Strong support from national policies

In recent years, the state has issued a series of relevant policies to support the development of the aviation logistics industry, which lays a solid foundation for the future development of our aviation logistics industry. According to the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of 2035 Long-term Goals, it is necessary to optimize international logistics channels and speed up the formation of a safe and efficient logistics network with internal and external connectivity. We will improve the modern commercial circulation system, cultivate a number of modern circulation enterprises with global competitiveness, and basically complete the national comprehensive airport system with world-class airport cluster and international aviation (cargo) hub as the core by 2035, so as to create a "global 123 express logistics circle". In February 2022, the Civil Aviation Administration issued the 14th Five-Year Plan for the Development of Aviation Logistics. It pointed out that by 2025, a safe, intelligent, efficient and green aviation logistics system will be initially established, with significantly enhanced aviation logistics support capacity, significant cost reduction and efficiency improvement, and the system's autonomous and controllable ability greatly improved. Aviation logistics continues to improve its service capacity for high-end manufacturing, postal delivery, cross-border e-commerce and other industries.

（2）Demand brought by the rapid development of cross-border e-commerce industry

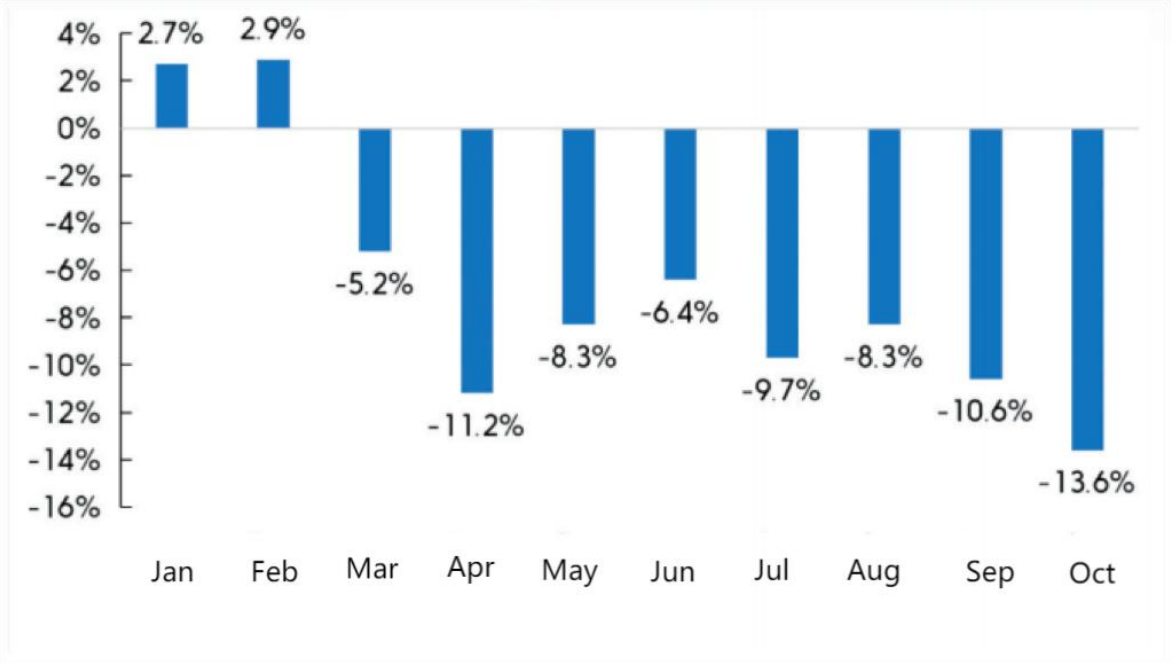
In recent years, the cross-border e-commerce industry, as one of the important driving factors for the development of the aviation logistics industry, has maintained a vigorous development trend. The recent three years of COVID-19 has accelerated the trend of

global retail going online. Cross-border e-commerce's demand for international express services constitutes an important source of freight for aviation logistics industry, and its rapid development drives the continuous prosperity of China's aviation logistics market.

4.2.2 Threat

（1）Adverse impact of the global environment

In 2022, due to the combined impact of multiple adverse factors, such as repeated COVID-19, geopolitical disputes, trade frictions, soaring energy prices and economic inflation, the global economic recovery is weak, and the demand for air cargo market recovers slowly. The global demand for air cargo (CTK) is significantly lower than the same period in 2021, with an average monthly growth rate of -6.8%. Year-on-year growth has been negative for eight consecutive months since March 2022. It can be seen that the global freight market demand has decreased significantly and the uncertainty has increased.



Fugure 1 （Zhang，2023）

Year-on-year growth of global air cargo demand (CTK) from January to October 2022

（2）Competition among airports and aviation logistics parks in surrounding areas

At present, in order to seize the air cargo market, Xinzheng Airport and other key cities around the airport in order to seize the air cargo market opportunities in the fierce competition. In the surrounding areas of Henan, provinces and cities with geographical advantages are strengthening the construction of local key airports and air freight logistics parks. For example, Wuhan Tianhe International Airport, which is relatively close to

Zhengzhou, is a key construction project in Hubei Province. The third phase is about to be completed, aiming to make Tianhe International Airport into the fourth largest aviation hub in China. Shaanxi province will build Xianyang Airport into an air cargo center in western China. In addition, in some other key indicators, compared to Xinzheng Airport, other airports currently have a big advantage. This makes the investment attraction competition of aviation logistics parks more intense, so that Zhengzhou Airport construction logistics park, the development of aviation logistics industry faces greater challenges.

（3）Increased competition from other modes of transport

Shipping and railway, as the main modes of transport serving the global economic and trade activities, have also shown a good momentum of development in recent years, competing with the development of air logistics. Compared with air logistics, shipping has the advantages of large volume and low unit transportation cost, while railway transportation has the advantages of fast transportation speed, large carrying volume and limited influence by natural conditions. In the future, as China's status in the global economic and trade system continues to improve, the industry competition from the China-Europe freight train, China-Europe road and other land transport and shipping fields may be further intensified, which will have a negative impact on the development of the aviation logistics industry.

4.2.3 Advantage

（1）Advantageous geographical location

Henan province is located in the central part of our country, Nantong, connecting north, expressway, railway developed, has more advantages in comprehensive traffic and logistics system. Moreover, Zhengzhou has the advantages of location and comprehensive transportation. With complete railway and highway network, Zhengzhou has already become a national highway and railway freight hub, which is easy to realize the perfect connection between highway, railway logistics and air logistics. Moreover, the distance between Xinzheng Airport and various airport groups is moderate, so there is broad space for the development of air logistics.

（2）Increasing cargo throughput

In recent years, Xinzheng Airport adopts the air cargo development idea of "cargo first and international first" and defines the differentiated development strategy of international aviation hubs. Aviation logistics has achieved rapid development and air cargo throughput has reached new highs repeatedly. In 2011, the cargo throughput of Xinzheng Airport was

only 102,800 tons, ranking the 18th in China. In 2020, in the context of the severe impact of COVID-19 on air transport, the cargo throughput of Xinzheng Airport reached 639,400 tons, with a year-on-year growth rate of 22.49%, ranking 6th in China in cargo throughput. From 2011 to 2020, the average annual growth rate of cargo throughput is as high as 20.05%, much higher than the national average growth rate of 3.34%. Since 2017, the cargo scale has ranked the first among central airports, and the performance of air cargo is very outstanding among major airports in China. Figure 2 shows the cargo throughput and growth rate of Xinzheng Airport from 2011 to 2020.

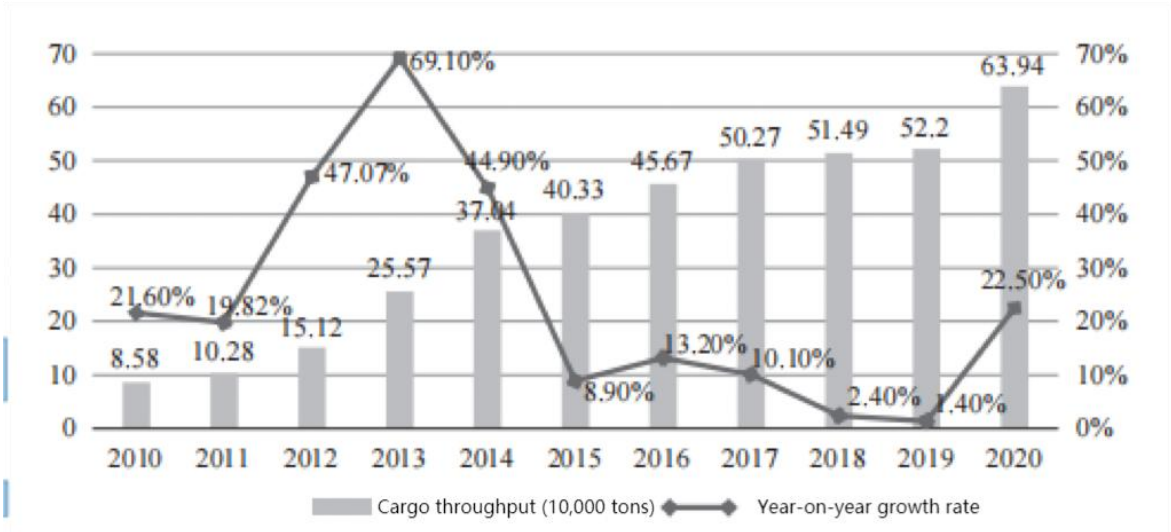


Figure 2 （Zhang,2023）

Air cargo throughput and growth rate of Xinzheng Airport from 2011 to 2020

（3）The airport industrial system has been continuously improved

The development of aviation logistics and the continuous strengthening of airport industrial system around the airport complement each other. Zhengzhou Airport Economic Comprehensive Pilot Zone, with Xinzheng Airport as the core, focuses on the development of high-end industries with airport orientation and relevance, and the competitiveness of the airport industrial system is constantly enhanced. At present, Zhengzhou Airport has initially formed an airport industrial system led by aviation logistics industry, focused on high-end manufacturing industries such as aviation manufacturing, electronic information and biomedicine, and supported by aviation exhibition, supply chain finance, headquarters economy and other services. Industries complement each other and develop together, providing strong support for the future development of Xinzheng Airport. According to statistics, the total GDP of Zhengzhou Airport in 2022 reached 120.8 billion yuan, with a year-on-year growth of 14.1%. The effect of airport economic industrial system with aviation logistics as the core to promote the economic development of Henan Province continues to highlight.

4.2.4 Disadvantage

（1）Backward infrastructure

Due to the phenomenon that passengers are always valued over goods in the aviation field, the development of aviation logistics industry in Xinzheng Airport lags behind. The infrastructure construction and ground supporting services related to aviation logistics cannot meet the rapid arrival of goods to the destination and the rapid growth of logistics demand, thus restricting the rapid development of aviation logistics. At present, Xinzheng Airport lacks professional air cargo logistics facilities, which are as follows: Firstly, there are few professional cargo planes. The cargo transportation of airlines mainly relies on the belly compartment of passenger planes to load cargo. Passenger planes have less space and can only load small cargo, while cargo planes have more space and larger load capacity. Secondly, there are few large companies and freight forwarding companies. Drawing on the experience of successful airports at home and abroad, large airlines or freight forwarding companies are the main force to promote the development of aviation logistics in Zhengzhou.

（2）The comprehensive informatization of Zhengzhou Xinzheng Airport is not perfect

At present, informatization has formed a development trend nationwide. Airlines and freight forwarding companies at all levels in Xinzheng Airport have their own freight information systems. However, due to different development technologies, different use standards, independent systems and incompatible systems, logistics information cannot be cross-platform booking, inquiry and use. Therefore, it restricts the development of aviation logistics at Xinzheng Airport. The aviation logistics business of Xinzheng Airport is mainly provided by airlines to freight forwarders with information such as route, flight, shipping space and price. Due to the lack of unified open platform, the price is relatively opaque, and shippers mainly inquire information and handle business through the system of freight forwarders. The information between airlines and freight forwarders cannot be synchronized from time to time. In the arrangement of loading, unloading and other aspects can not be real-time processing, affecting the speed advantage of aviation logistics. And because there is no unified logistics information platform, it cannot be effectively connected with highway, railway, sea and other logistics systems, and the comprehensive transportation advantages of multimodal transport cannot be fully played. It cannot be effectively connected with customs, commodity inspection and other port customs clearance systems, which reduces efficiency and restricts development.

（3）The lack of professional talents

With the rapid development of the aviation logistics industry, professional aviation logistics personnel are very popular and in great demand. However, at present, talents in the field of aviation logistics are very scarce, because the history of aviation logistics industry is not long, and many universities do not offer this major. As a result, enterprises have to train aviation logistics talents from ordinary logistics graduates, and conduct professional training for them after entry. However, this will consume time and energy, cost, and waste the resources of enterprises. Compared with Western countries, Chinese logistics industry started late, and the establishment of logistics system is still not perfect. For the training of logistics professionals, more stay in the theoretical level, lack of practical experience, and can not meet the requirements of modern logistics talents.

4.3 Air cargo throughput forecast

The original sequence data of cargo and mail throughput of Zhengzhou Airport during 2013-2022 are as follows:

$$x_0 = \{25.6,30,40.3,45.7,50.3,51.5,52.2,63.9,70.5,62.5\}$$

The sequence generated after one accumulation is:

$$x_1 = \{25.6,55.6,95.9,141.6,191.9,243.4,295.6,359.5,430,492.5\}$$

The data matrix B is: $B = \begin{bmatrix} -\frac{1}{2}[x^{(1)}(2)+x^{(1)}(1)],1 \\ -\frac{1}{2}[x^{(1)}(3)+x^{(1)}(2)],1 \\ \cdots \\ -\frac{1}{2}[x^{(1)}(n)+x^{(1)}(n-1)],1 \end{bmatrix} = \begin{bmatrix} -40.6 & 1 \\ -75.75 & 1 \\ -118.75 & 1 \\ -166.75 & 1 \\ -217.65 & 1 \\ -269.5 & 1 \\ -327.55 & 1 \\ -394.75 & 1 \\ -461.25 & 1 \end{bmatrix}$

The data vector Y is: $Y = [30,40.3,45.7,50.3,51.5,52.2,63.9,70.5,62.5]$, Then, the least squares estimation of parameters of gray prediction model $x^{(1)}(\mathrm{m}+1) = [x^{(1)}(1) - \frac{b}{a}]e^{-am} + \frac{b}{a}$ is

$$\hat{U} = \begin{bmatrix} \hat{a} \\ \hat{b} \end{bmatrix} = (B^T B)^{-1} B^T Y = \begin{bmatrix} -0.0799 \\ 33.4551 \end{bmatrix}$$

The grey prediction model of cargo and mail throughput of Zhengzhou Airport is as follows:

$$x^{(1)}(m+1) = 455.1518e^{-0.0799m} - 418.1899$$

The relevant values of the data are shown in the following table1:

Table 1

Serial number	Calculated value $\hat{x}^{(0)}(k)$	Actual value $x^{(0)}(k)$	Residual error $E(k)$	Relative error $e(k)$
2013	25.6	25.6	0	0
2014	36.96189992	30	-6.96189992	-0.232063331
2015	40.04034309	40.3	0.259656908	0.006443099
2016	43.37518035	45.7	2.324819655	0.050871327
2017	46.98776596	50.3	3.312234044	0.065849583
2018	50.90123273	51.5	0.598767269	0.011626549
2019	55.14064014	52.2	-2.940640139	-0.056334102
2020	59.73313478	63.9	4.166865224	0.065209158
2021	64.70812419	70.5	5.791875808	0.082154267
2022	70.0974652	62.5	-7.597465204	-0.121559443

The fitting graph of data is shown in the figure:

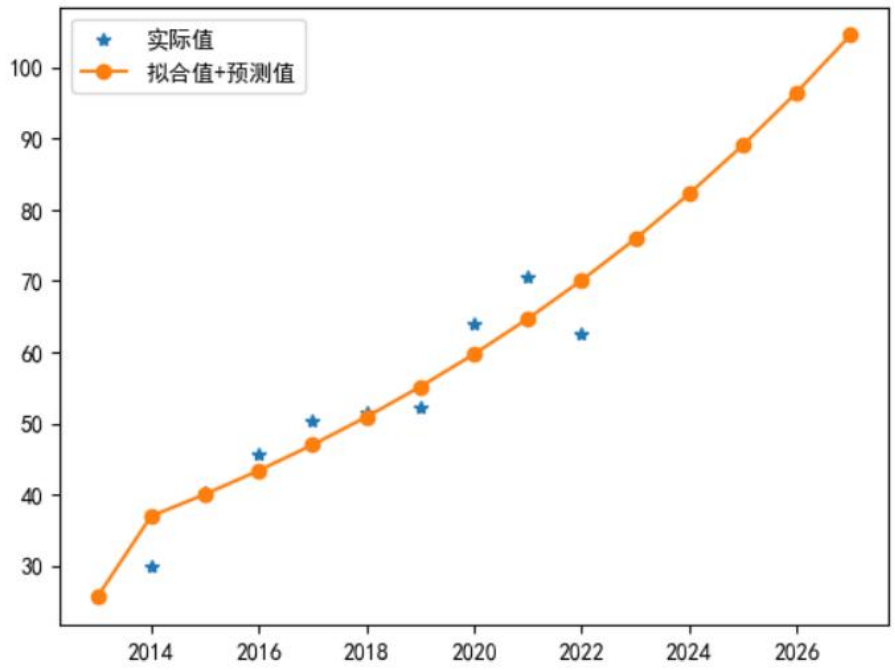


Figure 3(Zhang,2023).

The average relative residual was 0.0692, so the fitting effect was considered good.

Table 2

Data type	Posterior difference ratio	Small error probability	Precision class
Cargo throughput	0.0970	1	Good

Based on the correctness of the model, this paper predicts the data of the next five years, as shown in the table3:

Table 3

Year	Predicted value
2023	75.93566788
2024	82.26011654
2025	89.11130911
2026	96.53311648
2027	104.57306339

The prediction results obtained by using the grey system theory show that the total throughput of Zhengzhou Xinzheng International Airport will continue to increase from 2023 to 2027, which indicates that Zhengzhou Xinzheng International Airport will have more cargo volume, and further proves that the current situation of aviation logistics of Xinzheng Airport should be improved to facilitate the future development.

4.4 Aviation logistics planning suggestions for Zhengzhou Xinzheng International Airport

This section proposes the author's own opinions based on the previous analysis of aviation logistics in Xinzheng International Airport.

4.4.1 Improve basic security

（1）Optimize passenger and cargo route network

We will actively build a networked and large-scale air logistics system and speed up the formation of air cargo distribution centers. On the one hand, it is necessary to build a first-class domestic air route network, improve the accessibility of domestic cities, and build air express lines between airports and key cities by further increasing the air route density between Beijing, Guangzhou and Chengdu. China's economic hotspots will be connected with China, covering all provincial capitals. Targeted at domestic popular tourist cities to meet the ever-increasing travel demand; We will strengthen cooperation with low-cost airlines and give priority to opening 2-hour routes to prefecture-level cities.
On the other hand, we should build a first-class international air route network, improve the accessibility of international cities, actively explore overseas markets, add new

international cargo routes and introduce international airlines by giving full play to the advantages of the hometown of overseas Chinese. While building the airport, we must pay attention to image management, devote ourselves to building international brands, attract more international airlines to settle in and invest, so as to form industrial agglomeration effect. Not only airlines, but also internationally famous freight forwarding companies and logistics companies will come here, which will not only get a qualitative improvement in infrastructure construction, but also contribute to the development of logistics industry in the airport port area.

（2）Improving the construction of comprehensive information platforms

The biggest feature of a modern logistics network platform is networking and information, which can provide open basic information service for many users such as air logistics enterprises, cargo owners, customs, commodity inspection, land and air transport service enterprises. The construction of public information platform of aviation logistics in Xinzheng Airport is not perfect. Facing the current situation of independent information platform of various departments, it should be integrated to establish a comprehensive information management system of aviation logistics. There are four types of participants in aviation logistics: cargo owners, freight forwarders, airport cargo terminals, airlines or their agents. The basic procedure of aviation logistics in Xinzheng Airport is that the airline or its agent offers to the freight forwarder, the owner contacts the freight forwarder for inquiry and booking, and the freight forwarder will ship the booked cargo to the airport cargo station for sorting and distribution by the airline company. The isolated electronic information system of each participant makes the information acquisition and processing meet the bottleneck of development, such as opaque and slow. However, the new cargo business system of Xinzheng Airport was launched in July 2013. With this opportunity, other participants can be encouraged to unify the standards, update the logistics information system and integrate the logistics information system platform. So as to achieve the smooth exchange and management of internal data, so that any participant can inquire price, shipping space, logistics, warehousing and other information through the system port, can carry out online billing, transfer documents and other operations. The external caliber of the system platform can be connected with the customs, commodity inspection, bank, tax and other port systems to realize the value-added services of air logistics, such as online customs declaration, inspection, tax payment, payment for goods and other functions. For example, after inquiring through the system platform, the freight forwarding company will deliver documents to the customs before the goods arrive at the airport and declare in advance. After the goods arrive at the airport, they can be released directly, thus shortening the time of the whole transportation process.

（3）Cultivate and introduce professional talents

High-quality complex talents are the intellectual support for the construction of international aviation logistics hub. Aviation logistics is a talent and technology intensive industry, which has the characteristics of knowledge intensive, technology intensive, capital intensive and labor intensive, and involves a wide range of fields. The training of logistics talents needs to lay emphasis on the construction of capacity and the cultivation of high-end talents. We should keep the strategy of combining theory with practice and focus on the cultivation of talent's practice and innovation ability. The "base-project-talent" integrated training mode should be established, and relevant colleges and research institutions should be strongly encouraged to carry out extensive academic exchanges, strengthen innovation, and strengthen the cultivation of innovative talents.

4.4.2 Enrich air cargo sources

（1）Explore local characteristic products

Zhengzhou Xinzheng International Airport should base on the industrial foundation and cultural resources of Zhengzhou area, study the types of local goods suitable for air cargo, and actively develop air cargo sources with local characteristics. In order to put aviation factors into the industry with comparative advantages in Zhengzhou, relying on Zhengzhou's "Green City" name, Yanhuang culture, Shaolin Temple and other Zhengzhou city brand awareness, combined with the current more popular e-commerce goods, design the corresponding freight mode, such as setting up cargo station sales counters in the airport, sales and freight concentrated in the airport to complete the one-click.

（2）Expand cross-border e-commerce business

New business forms and models represented by cross-border e-commerce will become the core driving force for the growth of air logistics. Xinzheng Airport should speed up the construction of cross-border e-commerce cargo facilities, improve the efficiency of cross-border e-commerce customs clearance and other measures to comprehensively improve the airport's cross-border e-commerce logistics service capacity.

4.4.3 Strengthen collaboration

An efficient and convenient cargo pooling system is an important aspect of the airport's aviation logistics competitiveness. The airport needs to promote the effective connection with road, railway and other modes of transport, give full play to the advantages of mobile and flexible road transport and safety and economy of railway transport, actively develop

the "truck flight" business, implement the "direct loading and direct lifting" business on the apron, innovate the aviation logistics service mode and improve the support capacity. Through air, public and rail combined transport, a three-dimensional transport network will be built, the industrial chain and service chain for surrounding areas will be extended, and Xinzheng Airport will become the core growth pole of the Central Plains Economic Zone and an international aviation logistics center.

5 Conclusion

This chapter is mainly a summary of this thesis, expressing the author's understanding of the graduation thesis and expectations for the future.

5.1 Research conclusion

In the face of the end of the epidemic, the aviation industry has ushered in a revival. The development of aviation logistics as the representative of the airport economic industry will become a new source of economic development in Henan Province in the future. Under the background of constructing the national comprehensive three-dimensional transportation network and the new development pattern of double circulation, making a good plan for the future is also the top priority of Zhengzhou Government. The main research of this paper is summarized as follows:

First of all, the paper makes a detailed literature review on the theoretical basis of aviation logistics, and summarizes the theories related to the paper. Determine the research content, thinking and direction of the article.

Secondly, the grey prediction method is used to forecast the air cargo throughput of Zhengzhou Xinzheng Airport in the next ten years (2023-2027). The forecast results show that the throughput will maintain a stable growth in the future, which provides data support for the following research. Thirdly, combining the forecast results and the current development status of aviation logistics of Xinzheng Airport, this paper discusses the advantages and disadvantages of Xinzheng Airport by PEST analysis and SWOT analysis, and in combination with the future development of aviation logistics of Xinzheng Airport, and lays a foundation for the final planning opinions. Finally, according to the future goals and strategies of aviation logistics of Xinzheng Airport, from the aspects of improving basic security, enriching air cargo sources and strengthening cooperation, actively respond to the planning suggestions of aviation logistics development.

5.2 Research prospect

Aviation logistics is an emerging field in China, and the research on it is still relatively few. However, with the implementation of the "One Belt, One Road" policy, aviation logistics and aviation logistics park will be vigorously developed in China. This paper analyzes the development and future planning of aviation logistics of Zhengzhou Xinzheng International Airport. However, due to the limited time, relevant professional knowledge and ability of the author, there are still some deficiencies:

For the prediction of future logistics throughput, due to many factors affecting air logistics, such as not considering the future population, economic development and other factors of

Zhengzhou, it is too simple and rough to directly use the method of combining grey prediction model to predict the future air cargo throughput, so the prediction method needs to be further refined to improve the accuracy and credibility.

In the future, in the process of study and work exploration, I will continue to strengthen theoretical learning, reconstruct the knowledge system and update the way of thinking. In the follow-up relevant research work, I will strive for a broader, deeper and long-term research direction, carry out analysis with more advanced scientific theories and more rigorous research methods, and focus on solving the limitations in the research process. Put forward more practical, more instructive and more valuable countermeasures and suggestions, to promote the aviation logistics of Zhengzhou Xinzheng Airport and Zhengzhou regional economic development of the analysis and research contribution.

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