Journal of Education and Educational Research
ISSN: 2957-9465 | Vol. 18, No. 2, 2026

Research on the Supply-Demand Status and Training System Construction of Smart Airport Operation Talents in the Guangdong-Hong Kong-Macao Greater Bay Area

Haiyang Cui [1, a], Xueyuan Zhang [1, b], Zhiqin Wang [2, c], Jia Yang [3, a], Yingying Huang [1, c], Niannan Wang [1, a]

[1] Guangzhou Civil Aviation Vocational and Technical College, Guangzhou, Guangdong, 510403, China
[2] Guangdong Technology college, Zhaoqing, Guangdong, 526000, China
[3] Guangzhou Institute of Science and Technology, Guangzhou, Guangdong, 510403, China
[a] 812329866@qq.com, [b] 18344214148@163.com, [c] 1159189168@qq.com

Abstract: With the rapid development of a world-class airport cluster in the Guangdong-Hong Kong-Macao Greater Bay Area, the demand for high-quality technical talents in smart airport operation is growing. This paper analyzes the supply and demand of smart airport operation talents, identifies structural contradictions between talent cultivation and industry needs, and clarifies new requirements for talent training. It also points out deficiencies in current training programs and puts forward optimization strategies. The study suggests establishing a government-college-industry-enterprise collaborative mechanism to integrate professional standards, curriculum systems and teaching resources, so as to closely connect the education chain, talent chain and industrial chain, and provide strong talent support for the smart airport cluster construction in the Greater Bay Area.

Keywords: Guangdong-Hong Kong-Macao Greater Bay Area; Smart Airport; Operation Talents; Supply-demand Status; Training System.

1. Introduction

The construction of a world-class airport cluster in the Guangdong-Hong Kong-Macao Greater Bay Area is an important part of China's national strategy of strengthening civil aviation. The Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area issued in 2019 clearly proposed building a modern comprehensive transportation system and a world-class airport cluster. In 2020, the Civil Aviation Administration of China issued the Implementation Opinions on Supporting the Coordinated Development of Civil Aviation in the Guangdong-Hong Kong-Macao Greater Bay Area, which proposed to fully build a safe, coordinated, green, smart and humanistic world-class airport cluster by 2035. Among the four types of airport development, smart construction serves as the guide, supporting the realization of safe, green and humanistic goals through digital technologies. However, talent is the primary resource for development, and the quality of smart airport operation talent training directly determines the effectiveness of airport cluster construction.

At present, the Greater Bay Area has three major international aviation hubs: Hong Kong, Guangzhou and Shenzhen. Zhuhai Airport has stepped into the ranks of 10-million-level large airports, and the airport cluster is becoming an important node in the global air transport network. Meanwhile, the contradiction between supply and demand of smart airport operation talents has become increasingly prominent. On the one hand, large airports with a high degree of intelligence urgently need compound and innovative talents. On the other hand, the mismatch between talent cultivation and industrial development has led to the coexistence of structural contradictions such as talent shortage and employment difficulty. Therefore, it is of great theoretical value and practical significance to deeply study the supply-demand status of smart airport operation talents in the Greater Bay Area and construct a training system adaptable to intelligent development.

2. Current Development of Smart Airport Operation in the Greater Bay Area

The civil aviation industry in the Greater Bay Area is in a critical period of digital transformation. As an international aviation hub, Guangzhou Baiyun International Airport covers more than 230 destinations worldwide and ranked first in China in passenger throughput for four consecutive years from 2020 to 2023. Shenzhen Airport Group is fully implementing the five development strategies of "passengers, cargo, city, people and intelligence", striving to build a high-quality international aviation hub. The establishment of Zhongguang Smart Technology Co., Ltd., a provincial-level low-altitude economic industrial development platform in 2024, marks that the digital and intelligent transformation of the civil aviation sector has entered a new stage[4].

In terms of smart airport construction, major airports are accelerating the construction of an operation system featuring comprehensive IoT connection of production factors, data sharing and collaborative intelligence. Guangzhou Baiyun Airport has launched a technical trainee program to cultivate technical backbones through three stages: "technical foundation", "project practice" and "professional improvement". Shenzhen Airport has jointly built laboratories with universities, focusing on the application of artificial

intelligence and big data analysis in scenarios such as intelligent flight scheduling and intelligent foreign object detection. In March 2025, the Civil Aviation Talent Cultivation Alliance was established in Zhuhai with the participation of 16 civil aviation colleges and universities, marking a new journey for the integration of civil aviation education and industry in the Greater Bay Area [1][7].

Table 1. Current Status of Smart Construction of Major Airports in the Guangdong-Hong Kong-Macao Greater Bay Area

Airport/Platform	Core Position	Focus of Smart Construction	Talent Training Measures
Guangzhou Baiyun Airport	International aviation hub, ranking first in passenger throughput in China	Digital twin, intelligent scheduling, global IoT connection, collaborative operation	Three-stage training for technical trainees
Shenzhen Bao'an Airport	High-quality international aviation hub and air cargo hub	AI scheduling, intelligent security, smart cargo, digital operation	University-enterprise joint laboratories, industry-education training
Zhuhai Jinwan Airport	10-million-level trunk airport, western aviation node of the Greater Bay Area	Intelligent operation, low-altitude supporting facilities, regional collaboration	Leading the establishment of the Civil Aviation Talent Cultivation Alliance
Zhongguang Smart Technology Co., Ltd.	Provincial-level platform for low-altitude economy and civil aviation digitalization	BIM, digital infrastructure, virtual simulation, full-cycle management	Digital technical talent training and standard output

3. Main Problems in the Supply and Demand of Smart Airport Operation Talents on the Greater Bay Area

Despite active exploration by various parties, the contradiction between supply and demand of smart airport operation talents remains prominent.

First, there is a coexistence of insufficient talent quantity and structural imbalance. According to data from the Civil Aviation Administration of China, the number of civil transport airports in China is expected to reach 270 by 2025. The newly built airports generate a huge demand for talents, while the reserve of talents in positions such as airport operation command, apron control, and intelligent system operation is obviously insufficient.

Second, talent cultivation is mismatched with industrial demand. Undergraduate talents have a solid theoretical foundation but lack professional post training, while vocational college talents have strong practical ability but are limited by academic qualifications and insufficient innovation capacity.

Third, the integration of industry and education is insufficient. Enterprises' participation in talent training needs to be improved, and there is a disconnect between college teaching resources and real enterprise scenarios, resulting in a long period of on-the-job training for graduates after employment.

4. Requirements for Talent Training in Smart Airport Operation in the Greater Bay Area

The complexity of smart airport operation, high requirements for safety and efficiency, and the in-depth application of new technologies determine that operation talents must possess multi-dimensional capabilities and qualities.

4.1. Knowledge Structure

A comprehensive interdisciplinary knowledge system is required. In addition to basic professional knowledge such as civil aviation transportation, airport operation management, and aviation meteorology, talents must master emerging technical knowledge including smart airport security systems, collaborative UAV inspection, and cross-border e-commerce aviation logistics. The 2026 technical trainee recruitment of Guangzhou Baiyun International Airport covers four major categories: transportation, safety management, mechanical engineering, and digital R&D, reflecting the demand for interdisciplinary knowledge structure [6][8].

4.2. Competency and Ability

High-level comprehensive capabilities are essential. First, operation command and emergency response ability, enabling rapid decision-making and accurate scheduling during flight delays and accidents. Second, digital technology application ability, including familiarity with BIM, digital twin, artificial intelligence and other technologies in airport operation scenarios. Third, communication, coordination and teamwork ability to adapt to multi-stakeholder collaboration in airport operations. Fourth, international vision and cross-cultural communication ability to support the construction of international aviation hubs in the Greater Bay Area.

4.3. Professional Literacy

Strong safety awareness, rigorous work attitude, and professional spirit of continuous learning are required. Smart airport operation posts impose high requirements on detail control, quick decision-making and stress resistance. Fresh graduates generally earn a starting salary of 4,000–6,000 RMB per month, which can exceed 8,000 RMB after obtaining relevant professional certificates, reflecting the industry's recognition of high-quality talents.

5. Current Status of Talent Training Programs

At present, a multi-level and multi-type education system for smart airport operation talents has been formed in the Greater Bay Area, but many deficiencies still exist.

In terms of major setup, vocational colleges offer the major of Airport Operation Service and Management (Code 500408)[2], with core courses including airport operation command, apron management, and airport emergency rescue. Undergraduate institutions offer majors such as Transportation (Civil Aviation Direction) and Airport Operation and Management. Since 2024, some colleges have

explored the undergraduate vocational major of Smart Airport Operation and Management. Overall, however, major setup lags behind technological development, and the emerging curriculum system related to smart airports remains incomplete.

In terms of curriculum system, existing courses tend to emphasize traditional content over emerging technologies and theory over practice. Many institutions focus on traditional operation management while lacking coverage of smart security, digital twin, intelligent flight scheduling and other new technologies. According to surveys, Guangzhou Institute of Foreign Trade and Economics has introduced VR virtual training and built an interdisciplinary curriculum system of "aviation service + smart culture tourism", but such explorations remain rare.

In practical teaching, training conditions vary greatly. Guangzhou Civil Aviation College has built a virtual simulation training base for smart airport operation management. Guangzhou Institute of Science and Technology, in cooperation with Hong Kong International Aviation Academy, has launched a two-day and one-night study tour, allowing students to learn on-site in core areas such as aprons[3]. However, most colleges have limited training conditions and insufficient access to real business scenarios.

In terms of teaching staff, there is a shortage of "double-qualified" teachers with industry experience and digital literacy. Some teachers lack frontline airport experience and insufficient understanding of new smart airport technologies, making it difficult to transform the latest industry developments into teaching cases.

6. Optimization Measures for Talent Training Programs

In response to the above problems, talent training programs should be systematically optimized in terms of training objectives, curriculum system, training mode and guarantee mechanism.

6.1. Clarify Talent Training Orientation

Based on the development needs of the smart airport cluster in the Greater Bay Area, the orientation of cultivating high-quality technical and skilled talents shall be established. Guided by professional demand, focused on practical ability, and supported by industry-university-research cooperation, the goal is to cultivate interdisciplinary talents with core airport operation skills, digital literacy and international vision. Undergraduate education should strengthen theoretical foundation and innovation ability, while vocational education should highlight post competence and practical skills, forming a differentiated and hierarchical training structure.

6.2. Reconstruct Modular Curriculum System

A "platform + module" curriculum system will be constructed. Platform courses include Introduction to Civil Aviation, Aviation Law, Aviation Meteorology and other basic courses. Module courses cover operation command, smart technology, emergency management, international business and other directions. New courses related to smart airports will be added, such as smart security systems, UAV collaborative inspection, BIM application, and big data analysis. The integration of courses and certificates will be promoted, integrating professional standards such as airport operation commander and civil aviation security inspector into the curriculum.

6.3. Deepen Government-College-Industry-Enterprise Collaborative Education

The role of the Civil Aviation Talent Cultivation Alliance will be fully utilized to establish a collaborative education mechanism. In-depth cooperation will be promoted between colleges and enterprises in co-constructing professional standards, mutual employment of teachers, and sharing of practice bases. Enterprises are encouraged to participate in formulating teaching standards and co-building industrial colleges, so as to achieve precise connection between the education chain, talent chain and industrial chain. The "Teacher Backfeeding Program" of Guangzhou Institute of Science and Technology will be promoted[3], where teachers receive pre-job training before students and convert real industry scenarios into teaching cases. Joint training of "civil aviation +" interdisciplinary talents between mainland and Hong Kong-Macao universities will be encouraged[9].

6.4. Strengthen Practical Teaching and Technological Innovation

Efforts will be made to strengthen the construction of virtual simulation training bases and build a high-fidelity teaching environment using VR/AR, digital twin and other technologies. The "three connections, two integrations, four supports" virtual simulation practice teaching system proposed by Guangzhou Civil Aviation College is demonstrative. Colleges and enterprises will jointly build laboratories to conduct technological research focusing on core business scenarios such as airport safety, operation and services[5]. Through the three-stage training of "technical foundation, project practice and professional improvement", students' technical application and innovation capabilities will be enhanced.

6.5. Improve Institutional Support and Evaluation Mechanisms

Government departments should play a leading role and establish a mutual recognition mechanism for civil aviation talents in the Greater Bay Area. Industry institutions should act as a bridge to formulate post competency standards and evaluation systems. Colleges should establish a graduate tracking and feedback mechanism to dynamically adjust training programs. Multiple evaluation subjects will be introduced, and enterprise evaluation and industry certification will be integrated into the talent training quality evaluation system.

7. Conclusion

The construction of a world-class airport cluster in the Guangdong-Hong Kong-Macao Greater Bay Area has put forward new and higher requirements for smart airport operation talents. At present, the structural contradiction between talent supply and demand has become an important bottleneck restricting the high-quality development of the airport cluster. To solve this problem, it is necessary to accurately grasp the new requirements of smart airport operation for talent knowledge, ability and professionalism, and systematically optimize talent training objectives, curriculum system, training mode and guarantee mechanism.

We should give full play to the institutional innovation

advantages of the Greater Bay Area, take the Civil Aviation Talent Cultivation Alliance as a platform, deepen government-college-industry-enterprise collaboration, promote the co-construction of professional standards, reconstruction of curriculum systems, and mutual employment and sharing of teachers, so as to realize the precise connection between the education chain, talent chain and industrial chain. Only in this way can we cultivate high-quality technical and skilled talents to meet the needs of smart airport development, and provide solid talent support and intellectual guarantee for building a world-class airport cluster in the Greater Bay Area and for building a strong transportation country in China.

Acknowledgments

This study is supported by the following projects:

Fund Project: 2022 Project of Guangdong Provincial Office of "Education Science Planning Research on Talent Demand and Training Strategies for Smart Airport Operation in the Greater Bay Area Project" Project No.: 2022GXJK438.

References

[1] Wang F. Establishment of "Civil Aviation Talent Cultivation Alliance" to Cultivate Talents for Building a World-Class Aviation Industry Cluster in the Greater Bay Area[N]. Zhuhai Net, 2025-03-21.

[2] Introduction to Airport Operation Service and Management Major[EB/OL]. Guangdong Vocational College Entrance Information Network.

[3] Guangzhou Institute of Science and Technology and Hong Kong International Aviation Academy Jointly Build an Immersive New Track for Talent Cultivation[EB/OL]. Guangzhou Institute of Science and Technology, 2025-05-22.

[4] 2026 Campus Recruitment of Zhongguang Smart (Guangdong) Technology Co., Ltd. [EB/OL]. Shenzhen MSU-BIT University, 2026-02-24.

[5] Shenzhen Technology University and Shenzhen Airport Group Explore New Development Paths in Aviation[EB/OL]. Shenzhen Technology University, 2026-03-13.

[6] Guangzhou Baiyun International Airport Launches 2026 Technical Trainee Campus Recruitment[EB/OL]. Southcn.com, 2025-10-19.

[7] Civil Aviation Talent Cultivation Alliance Established to Cultivate Talents for World-Class Aviation Industry Cluster[N]. South Plus, 2025-03-22.

[8] Presentation of Guangzhou Baiyun International Airport Co., Ltd. [EB/OL]. Guangdong University of Foreign Studies, 2025-10-23.

[9] Aligning with Civil Aviation Development Trends to Jointly Cultivate Greater Bay Area Civil Aviation Talents[EB/OL]. Guangzhou Songtian Vocational College, 2025-04-21.

[10] Expert Profile of Zhang Liang[EB/OL]. Civil Aviation Resource Network.