

# Exploration and Practice of Virtual Simulation Practice Teaching Construction for General Aviation Majors in Civil Aviation Colleges

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## Abstract

**The construction of a high-quality demonstration virtual simulation training base is an important measure to deepen, transform, and solidify the achievements of vocational education institution construction, and to comprehensively improve the level of vocational education institutions and focus on the development of connotation in the new era. The paper analyzes the principles of constructing a virtual simulation training base for general aviation operation support, Proposed the composition of the training environment and teaching conditions for the virtual simulation training base for general aviation operation support, Thoughts on the Construction of Teacher Team for the Virtual Simulation Training Base of General Aviation Operations Support; Operation Management Mode of Virtual Simulation Training Base for General Aviation Operations Support.**

## Keywords

**Virtual Simulation; General Aviation; Teaching Reform; Mechanism.**

## 1. Introduction

In the "Notice on Carrying out the Construction of National Virtual Simulation Experiment Teaching Centers" (Jiao Gao Si Han [2013] No. 94) issued by the Ministry of Education, it is clearly pointed out that the construction of virtual simulation experiment teaching centers must adhere to the guiding ideology of "scientific planning, resource and environmental sharing, highlighting key points, improving efficiency, and sustainable development", and its core work is to build high-quality experimental teaching resources. The construction of a high-quality demonstration virtual simulation training base is a deepening, transformation, and solidification of the achievements in the construction of vocational education institutions. It is also a strategic measure to comprehensively improve the level of vocational education institutions in the new era, focus on the development of connotation, build a virtual simulation training system that combines reality with virtuality, assist reality with virtuality, and combine virtuality with reality. It solves the pain points and difficulties of the "three highs and three difficulties" in the practical teaching process, and enhances social service capabilities, serves the employment training of enterprises and various personnel, and serves the technological innovation of industry enterprises.

## 2. Functional Positioning of Virtual Simulation Training Base for General Aviation Operation Support

The General Aviation Operations Support Virtual Simulation Training Base is designed to adapt to the new requirements of the national civil aviation power strategy and digital economy for the development of civil aviation. It focuses on the digital and intelligent transformation and upgrading of the general aviation industry, integrates the new Vocational Education

Professional Catalog with the new economy, new formats, new technologies, and new occupational regulations, and revolves around the general aviation operations support job group. It is connected with the business needs of general aviation aviation operations management, general aircraft control command, general aircraft airport operation management, general aircraft ground services, general aircraft maintenance and repair, and relies on new generation information technologies such as virtual reality and artificial intelligence to deeply integrate information technology and practical teaching, constructing a general aviation operations support virtual simulation training venue with perception, immersion, interactivity, conceptualization, and intelligence; We have built a virtual simulation training system that combines reality with virtuality, assists reality with virtuality, and combines virtuality with reality; Developed virtual simulation training resources that are aligned with job skills, talent training programs, vocational training programs, and internships; We have built a high-quality teaching team with the ability of "virtual simulation training teaching+virtual simulation training resource development"; Established a sound and comprehensive virtual simulation training base, management, and evaluation mechanism; We have established an open and shared comprehensive virtual simulation training base for general aviation operation support, which integrates teaching, practical training, training, scientific research, competition, popular science, and other functions.

### **3. General Aviation Operations Support Virtual Simulation Training Base Training Environment and Teaching Conditions**

The construction of the virtual simulation training base for general aviation operation support closely revolves around the new trends and technological requirements of the development of intelligent navigation operation support. Following the concept of "integration of industry and education, integration of science and education, and co construction and sharing", it realizes the use of information technology to promote online and offline sharing of educational equipment and teaching content; Realize the transition of professional practical training teaching from demonstration and validation to practice, design, and innovation; Realize the function of independent teaching and data integration training; Guided by multiple needs, fully considering future expansion of practical training teaching content, improvement of practical training teaching methods, and extension of practical training room functions, providing possibilities for the improvement of practical training room specifications and sustainable development; Realize unified design and centralized deployment, effectively avoiding duplicate construction and wasting resources.

General Aviation Professional Virtual Simulation Training Center. The virtual simulation center relies on the general aviation aviation technology major, general aviation aviation technology major (general aviation control direction), and general aircraft maintenance major of our institute's general aviation aviation support professional group to establish a virtual simulation system platform for general aviation meteorological services, a virtual simulation system platform for general aviation intelligence performance analysis, a virtual simulation system platform for general aviation control command, a virtual simulation system platform for on-site command of general aviation airports, and a virtual simulation system platform for ground service support of general aviation.

General Aviation Public Virtual Simulation Training Center. This virtual simulation center is used for conducting general education courses, course ideological and political education, and other teaching activities around the general aviation operation support professional group. Established a general aviation terminal immersive virtual simulation system platform, a cockpit panoramic immersive virtual simulation training platform, a cabin panoramic immersive virtual simulation system platform, a flight area panoramic immersive virtual simulation

system platform, and a general aircraft system immersive virtual simulation system operation platform.

General Aviation Virtual Simulation Experience Center. The center mainly implements general aviation flight experience, science popularization, and other work. Established a general airport VR full scene virtual simulation system platform and a general aviation flight control virtual simulation system platform.

General Aviation Virtual Simulation Research and Innovation Center. This center is mainly used for the development and debugging of virtual simulation training resources, providing technical support for the development of various new virtual simulation teaching resources and the upgrading and maintenance of existing resources. This mainly includes the development platform of virtual simulation teaching resources for general aviation, the platform of general aircraft performance calculation system, etc.

#### **4. The Situation of the Teaching Staff of the Virtual Simulation Training Base for General Aviation Operation Support**

The teaching staff of the General Aviation Operations Support Virtual Simulation Training Base consists of three parts: management team, information technology support team, and practical teaching professional team. The management team mainly includes an expert teaching guidance team consisting of experts from both inside and outside the school, relevant subject teachers, and leaders in charge of the training base. They are responsible for the planning and academic guidance of the virtual simulation training base for general aviation operation support; The information technology support team is mainly composed of professional teachers in the field of computer information technology in the school, responsible for the operation and maintenance of various teaching platforms in the virtual simulation training base for general aviation operation support; The practical teaching professional team currently has 20 full-time and part-time experimental and training teachers, of which 60.4% are teachers with senior professional titles, and 10 have more than 3 years of work experience in enterprises. The teaching team has strong teaching ability, high social reputation, a combination of full-time and part-time teaching, outstanding dual teacher quality, and a reasonable structure.

The teaching team members use modern information technology to promote the teaching reform of curriculum resources, meet the diverse learning needs of students, vigorously promote the new form of "Internet plus" and "intelligence+" education, and promote the deep integration of information technology and intelligent technology into the whole process of curriculum teaching. Select core job skills for general aviation operation support, create virtual simulation training teaching resources, achieve online and offline collaborative teaching mode, and comprehensively enhance students' hands-on ability.

The virtual simulation training project is an important carrier for phenomenon cognition, knowledge learning, application experience, and innovative exploration. In the experimental context, students are able to analyze and determine problems, learn problem-solving methods independently, conduct virtual simulation experiments to solve problems, and obtain summary and evaluation results. The General Aviation Operations Support Virtual Simulation Training Base is based on real general aviation operations support job experimental training environments, simulated operations, and real job cases. It focuses on three aspects: basic practical ability cultivation, comprehensive practical ability cultivation, and innovative practical ability cultivation. For specific job positions in general aviation operations support, the teaching resource library of virtual simulation experiment simulation training cases is designed in a step-by-step manner from easy to difficult, according to three levels: immersive experience module, integrated training module, and research innovative training module. The immersive experience stage mainly focuses on virtual simulation experience, with the aim of

enabling students to understand and recognize the work environment and important knowledge points; The integrated training stage mainly guides students to use professional knowledge to train in operational processes, key technologies, and quality management methods such as general airport apron taxiing command, general aviation aviation operation support, etc; The innovative application stage mainly relies on virtual simulation platforms to guide students to participate in cutting-edge research and technological verification in the field of intelligent navigation operation guarantee, and carry out innovation and entrepreneurship projects. Focusing on the construction of experimental projects, based on the learning stage, knowledge structure, cognitive patterns, and ability goals of students, an organic combination is formed to form a virtual simulation experimental project teaching resource library for airport operations.

## **5. Operation Management of Virtual Simulation Training Base for General Aviation Operations Support**

In order to better carry out the construction of the virtual simulation training base for general aviation operation support, deepen the reform of the school's virtual simulation teaching mode, and improve the quality of virtual simulation teaching, the school has established a smart campus construction transfer class led by the principal, to guide the construction of the virtual simulation training base for general aviation operation support, and to establish a school's high-quality development leadership group led by the vice principal in charge of planning to guide and coordinate the future construction of the profession. At the same time, a general aviation operation support virtual simulation training base construction and teaching resource development guidance committee composed of experts and technical personnel from regional management, airports, industry colleges, and research institutes has been established. Regular seminars will be held online and offline to guide the construction of the virtual simulation training base for general aviation operation support. Implement a project responsibility system, with specific responsible persons assigned to each construction sub project, who will coordinate and coordinate the project construction work.

In terms of construction mode, the General Aviation Operations Support Virtual Simulation Training Base adheres to the investment principles of highlighting characteristics, optimizing structure, and improving efficiency in accordance with relevant national policies. It is jointly built by the Civil Aviation Administration, schools, and enterprises, and builds a platform and link for the five party linkage, mutual communication, and close cooperation of "government school, enterprise, and research". It optimizes resource allocation, promotes cross-border integration and development, and forms a multi-level, three-dimensional, and multi subject cooperation model led by government regulatory departments, vocational education institutions, industry guidance, and enterprise integration, creating a construction pattern of joint construction, sharing, and win-win cooperation.

In terms of daily management, the center has established a management mechanism with the participation of government, administration, enterprises, and schools, clarifying the division of labor and responsibilities of all parties. The industry regulatory department of the Civil Aviation Administration of China provides guidance on the construction of various training rooms in the center, and introduces corresponding support and encouragement policy measures; The school is responsible for daily maintenance and management to ensure the normal operation of the platform; Industry enterprises update the equipment of the platform timely through cooperation projects to ensure the progressiveness of the platform.

In terms of open operation, in order to achieve sustainable development of the center, we adhere to the combination of public welfare services and market-oriented services. In addition to completing teaching and practical training, we actively strive to undertake tasks such as

training, production, and research and development from society. Firstly, we carry out public welfare projects, provide free services, and compensate through government purchase of services; The second is to carry out vocational training, skill appraisal, product production, practical training factories, technical services, technology research and development, and other projects, provide paid services, and charge reasonable fees in accordance with market-oriented principles. On the basis of reflecting openness, public welfare, sharing, and service, establish a deep integration operation mechanism of industry and education that exchanges services for resources and promotes development through resources.

In terms of intellectual property protection, the software and hardware construction of the virtual simulation training base for general aviation operation support is the result of intellectual labor from all parties and has obvious ownership of knowledge. The center focuses on intellectual property protection during its construction and operation, clarifies the ownership of intellectual property, and establishes a systematic mechanism for intellectual property protection. Confirm the ownership, protection, and allocation of newly formed intellectual property rights, and protect the existing intellectual property rights invested separately in the cooperation process. By properly confirming the ownership, evaluating the value, and allocating the use of intellectual property rights, we effectively protect the rights and interests of all participating parties, strengthen communication, and handle the transfer of intellectual property rights in accordance with laws and regulations, avoid disputes, and strive to maximize the intellectual property benefits of virtual simulation experiments in airport operation professional groups.

In terms of network security protection: do a good job in virus protection technology processing, thoroughly eliminate virus interference, adopt corresponding computer virus protection technology, timely detect viruses in the system of the virtual simulation training base for general aviation operation support, and effectively intercept computer viruses; Regularly use vulnerability scanning technology to inspect the network of the General Aviation Operations Support Virtual Simulation Training Base, identify vulnerabilities and their weaknesses that pose threats, and handle them; Using data encryption and other methods to ensure the network security of the virtual simulation training base.

## 6. Conclusion

The General Aviation Operations Support Virtual Simulation Training Base is based on the needs of the development of the general aviation industry to enhance talent practical abilities, combined with the training goals of general aviation operations support professionals such as general aviation aviation aviation technology, general aviation aviation aviation aviation technology (general aviation control direction), and general aircraft maintenance. With the support of new generation information technologies such as virtual reality and artificial intelligence, it deeply integrates information technology and practical teaching, constructs an experimental teaching environment that combines simulation and virtualization, and integrates the core job skills of general aviation operations support into the virtual simulation training platform; We have developed three levels of virtual simulation teaching resources: basic practical experiments, comprehensive practical experiments, and research exploratory experiments. We have integrated the core job responsibilities and workflow of general aviation operation support into the virtual simulation teaching resources, forming a highly simulated experimental teaching environment. We train students to do different job cognition and understand the relationship between the core job skills and external environment of enterprise content in practical training based on their majors, expand their practical knowledge, experience the real job working environment of the enterprise, enable students to perceive and adapt to the future actual job environment in advance, and enhance their confidence and

competence; Through virtual reality, multimedia, human-computer interaction, and the use of technologies such as databases and communication networks, bold innovation has been achieved in the experimental teaching environment, content, methods, and means. This has helped students master theoretical knowledge, increased opportunities for hands-on and practical experience, and enabled bold innovation in the experimental teaching environment, content, methods, and means. This has enabled students to better grasp the theoretical knowledge related to general aviation operation support, significantly enhance their self-learning ability, and significantly enhance their practical and innovative abilities.

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