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A Brief Discussion on the Development Trends and Employment Prospects of the UAV Industry under Information Technology

Ming Yang*

Civil Aviation Flight University of China, Guanghan, Sichuan, 618307, China

***Correspondence to:** Ming Yang, Civil Aviation Flight University of China, Guanghan, Sichuan, 618307, China, E-mail: yangming932@163.com

Abstract: Information technology, centered on computers and other core technologies, breaks through human physiological limitations and supports the full-chain development of the UAV industry. Driven by information technology, the UAV industry shows trends such as improved flight performance, enhanced intelligence, and upgraded communication and data transmission. Its employment fields continue to expand, job requirements are evolving, and new demands are placed on the competitiveness of job seekers. This paper recommends strengthening technological innovation cooperation, improving the industrial ecosystem, and expanding international markets to promote sustainable development of the UAV industry, enhance employment capabilities, and drive coordinated progress between industry and employment.

Keywords: Information technology; UAV industry; development trends; employment prospects

Introduction

In the era of rapid development of information technology, the UAV industry has rapidly emerged as a new force. Information technology provides solid support for the UAV industry throughout its entire life cycle, driving continuous innovation and transformation. From flight performance to intelligence levels, from communication transmission to data security, information technology guides the UAV industry toward a new stage of development. At the same time, the vigorous development of the UAV industry has created numerous employment opportunities, with expanding employment fields and increasingly diversified job requirements. An in-depth study of the development trends and employment prospects of the UAV industry under information technology is of significant practical importance.

1. Overview of Information Technology and the UAV Industry

1.1 Connotation of Information Technology

Information technology (IT), centered on computers, microelectronics, and communication technologies, is a technological system that extends human information-processing capabilities to achieve information acquisition, processing, storage, transmission, and utilization. Its essence lies in overcoming human physiological limitations and enhancing the efficiency and scope of information processing. The technological composition of IT rests on four main pillars: sensing technology, responsible for environmental perception and data collection; communication technology, which constructs information transmission channels; computer technology, which performs data computation and logical processing; and control technology, which drives system responses and execution. For instance, UAVs can use multispectral sensors to capture images of farmland, transmit data to the cloud via 5G, and adjust spraying parameters through AI algorithms, demonstrating coordination across the information chain. Modern IT is characterized by digitization, networking, and intelligence [1]. Digitization converts the physical world into binary code; networking enables global device interconnection through IP protocols; intelligence relies on deep learning algorithms for autonomous system decision-making. In UAV swarm coordination, a single UAV can locate itself via Beidou navigation, connect through LoRa networks, and use swarm intelligence algorithms for formation flight, integrating multiple technologies.

1.2 Definition of the UAV Industry

The UAV industry, centered on unmanned aerial vehicles, encompasses the entire chain of R&D and design, manufacturing, system integration, application services, and derivative value-added businesses. From a technical architecture perspective, a UAV system consists of the flight platform, mission payload, ground control station, and communication links. The flight platform includes subsystems such as propulsion, while mission payloads include equipment like electro-optical pods. The industry can be classified into two main categories: military and civilian, based on application scenarios. Military UAVs focus on reconnaissance and similar tasks, emphasizing stealth capabilities; civilian UAVs are divided into consumer and industrial grades, with industrial UAVs penetrating multiple industries. In 2024, China's industrial UAV market reached 128 billion yuan, accounting for 58.7% of the total market, with a shift toward high value-added sectors. Geographically, industrial clusters are concentrated in regions such as the Pearl River Delta innovation cluster, the Bohai Rim manufacturing cluster, and the western R&D cluster. Shenzhen Nanshan Science Park gathers leading companies and supporting enterprises, forming a complete industrial chain; by 2024, the industrial scale exceeded 80 billion yuan, representing 36% of the national share.

1.3 Supporting Role of Information Technology in the UAV Industry

Information technology spans the entire UAV life cycle, forming a "perception-decision-execution" technological loop. During R&D and design, CAD/CAE software optimizes aerodynamic shapes, and CFD simulations reduce wind tunnel testing costs; in manufacturing, CNC machine tools ensure precision, and automated assembly lines improve efficiency; at the application service level, big data platforms manage flight data, and digital twin technology optimizes mission planning. Breakthroughs in key technologies drive qualitative changes in the industry: AI algorithms improve obstacle avoidance accuracy, 5G communications enable 8K video transmission, and hydrogen fuel cells extend endurance. For example, XAG agricultural UAVs use multispectral cameras to identify crop diseases and generate prescription maps via edge computing to guide operations, improving pesticide utilization. The reconstruction of the industrial ecosystem has also fostered new business models, such as UAV-as-a-Service (UaaS).

2. Development Trends of the UAV Industry under Information Technology (Figure 1)

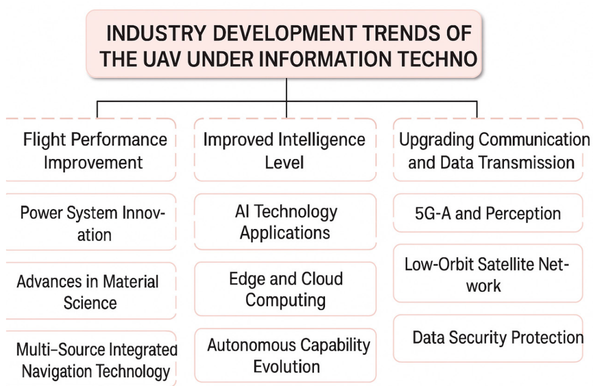

Figure 1 Development Trend of the Unmanned Aerial Vehicle Industry

2.1 Improvement of Flight Performance

Innovations in propulsion systems break physical limits. Hydrogen fuel cells with an energy density of 450 Wh/kg—three times that of lithium batteries—enable Zongteng UAVs to operate continuously for 12 hours. Hybrid propulsion technology combines the continuous output of fuel engines with the precise control of electric motors, maintaining stable service ceilings even in high-altitude regions. Advances in materials science drive structural lightweighting; the application of carbon fiber composites reduces airframe weight by 40% while tripling fatigue strength. The DJI M350RTK, for example, weighs only 3.7 kg but can carry a 1 kg payload. Navigation systems are evolving toward multi-source fusion. After the global deployment of Beidou-3, positioning accuracy reaches 0.3 m; combined with visual SLAM and UWB (ultra-wideband) technologies, a redundant "GNSS+IMU+Vision" navigation system is formed. The XAG P100 agricultural UAV, operating in hilly areas, constructs 3D terrain models using LiDAR and integrates barometric altimeter data, achieving ±5 cm terrain-following accuracy, effectively preventing pesticide drift [2].

2.2 Enhancement of Intelligence Levels

AI penetration has transformed decision-making paradigms. The YOLOv8 object detection algorithm achieves 120 fps real-time processing on UAV platforms, capable of recognizing 200 object classes. Reinforcement learning enables UAV swarms to autonomously perform formation changes without a central node; Kobitech Aerospace's "Tianmu" system has realized coordinated operations of 200 UAVs. The integration of edge and cloud computing has matured: the CW-15 UAV from Zongheng Co. is equipped with the NVIDIA Jetson AGX Orin module for local AI inference, while critical data are uploaded via a 5G private network for deep cloud analysis. The evolution of autonomy exhibits a three-stage leap: L1 (assisted flight) supports fixed-height, fixed-point, and fixed-distance flight; L2 (partially autonomous) enables automatic obstacle avoidance and route planning; L3 (fully autonomous) completes full environmental perception, mission decision-making, and emergency handling. The DJI Matrice 3D mapping UAV has achieved L3 autonomy, automatically identifying obstacles such as high-voltage lines and glass curtain walls in complex urban environments and planning optimal flight paths.

2.3 Upgrades in Communication and Data Transmission

5G-A integrated sensing and communication technology surpasses traditional communication boundaries. Using a 64T64R massive antenna array, UAVs achieve 300 m precise sensing, enabling dual "radar + communication" capabilities in complex urban environments. China Mobile's 5G-A base stations in Xiong'an New Area can simultaneously support 100 UAVs transmitting 8K video at 200 Mbps with latency under 10 ms. Low-orbit satellite internet constructs global coverage networks: Galaxy Aerospace's "Galaxy" constellation plans to deploy 1,000 satellites, providing 200 Mbps bandwidth connections to polar, maritime, and other remote regions. CASIC's "Hongyun Project" has launched four experimental satellites, enabling real-time UAV video transmission over the South China Sea, with a single satellite covering 1.5 million km². Data security systems are increasingly robust: quantum encryption technology is applied to flight data transmission, with Key Laboratory of Quantum Security Devices' quantum key distribution equipment updating communication keys at 1 MHz, effectively preventing man-in-the-middle attacks. Blockchain technology ensures data immutability; Meituan's UAV delivery system records key data such as flight trajectories and payload status on a consortium chain, achieving full-process traceability.

3. Employment Prospects of the UAV Industry under Information Technology (Figure 2)

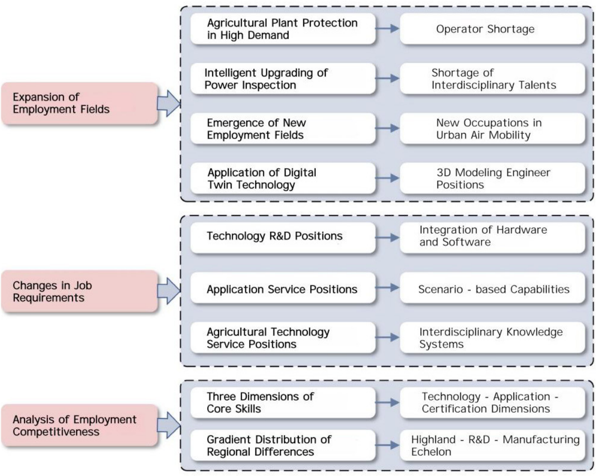

Figure 2 Employment Prospects of the Unmanned Aerial Vehicle Industry

3.1 Expansion of Employment Fields

Traditional employment fields continue to deepen. The demand in agricultural plant protection remains strong:

by 2024, the national fleet of plant-protection UAVs reached 251,000 units, with a shortfall of over 80,000 operators, and certified pilots commanding daily wages of 800-1,500 CNY. In the power inspection sector, intelligent upgrades have been implemented: after deploying UAV inspection systems, the State Grid reduced annual manual line inspection by 120 million kilometers, but the industry requires a large number of compound talents proficient in both power systems and UAV technology [3]. Emerging employment fields are constantly appearing. Urban Air Mobility (UAM) has generated new occupations such as flight operators and airspace managers. EHang's EH216-S passenger UAV conducted pilot operations in Guangzhou and Shenzhen, requiring professional teams for route planning, emergency handling, and passenger services. The application of digital twin technology has created positions for 3D modeling engineers. For example, Feima Robotics recruits BIM modelers proficient in ContextCapture, Revit, and related software, with monthly salaries ranging from 18,000-25,000 CNY.

3.2 Changes in Job Requirements

Technical R&D positions show a trend of "integration of hardware and software." Flight control system development engineers must have embedded Linux development skills and PID control algorithm design abilities, while also understanding aerodynamic principles. DJI's flight control engineers are required to be proficient with STM32H7 series chip development and familiar with the PX4 open-source flight control architecture, with annual salaries reaching 400,000-600,000 CNY. Application service roles emphasize scenario-based capabilities: logistics UAV dispatchers need to understand urban delivery network optimization algorithms. Meituan requires candidates to be skilled in tools such as OR-Tools and CPLEX for designing dynamic routing models. Agricultural technical service roles demand interdisciplinary knowledge: agronomists at XAG must master crop growth models, variable-rate pesticide application techniques, and UAV operation skills.

3.3 Employment Competitiveness Analysis

The core skills matrix includes three dimensions: the technical dimension requires proficiency in flight control algorithms, sensor fusion, communication protocols, and other hard skills; the application dimension emphasizes industry knowledge, scenario understanding, and solution design; the certification dimension requires qualifications such as the AOPA Civil UAV Pilot Certificate and UTC aerial photography professional certificates. Data show that professionals holding dual certifications (pilot license + industry certificate) earn 35% more than those with a single certification. Regional differences show a gradient distribution: Shenzhen, as an industrial hub, had an average monthly UAV industry salary of 12,000 CNY in 2024, 28% higher than the national average; Chengdu, Xi'an, and other western cities, leveraging research resources, concentrate talent in flight control algorithms and materials science, with R&D positions accounting for 35% of the workforce; manufacturing bases such as Zhengzhou and Hefei focus on full-system production, with strong demand for process engineers and test engineers.

4. Recommendations for Promoting UAV Industry Development and Enhancing Employment Capability

4.1 Strengthen Technological Innovation Collaboration

Establish a collaborative innovation system integrating industry, academia, research, and application ("industry-university-research-application"), and set up a national-level UAV innovation center. Integrate research capabilities from universities such as Tsinghua University and Beihang University, and cooperate with leading enterprises like DJI and CASC Rainbow to tackle key technologies. Focus on breakthroughs in "bottleneck" technologies such as high-precision navigation, intelligent obstacle avoidance, and swarm coordination, aiming to achieve 100% independently controllable flight control system development by 2025. Build open technology platforms, promoting open-source ecosystems like DJI SDK and PX4 to lower innovation thresholds for small and medium enterprises. DJI's Payload SDK has already attracted over 500 developers, spawning more than 300 specialized payloads including thermal imaging and multispectral sensors. It is recommended to establish a 1-billion-CNY-level industrial innovation fund, providing 30% R&D subsidies for application solutions developed on open-source platforms.

4.2 Improve the Industrial Ecosystem

Optimize airspace management mechanisms and implement "layered and categorized" airspace reforms. Pilot dedicated UAV airspace in free trade zones such as Xiong'an and Hainan, simplifying approval procedures for low-altitude flights below 120 m. Develop intelligent airspace management systems integrating ADS-B, 5G-A, and other technologies to achieve dynamic airspace allocation and conflict warning, improving airspace utilization by 40%. Construct a full-chain standard system, accelerating the formulation of national standards such as *Civil UAV Product Safety Requirements* and *UAV Data Interface Specifications*, and promote industry organizations such as AVIC Association and AOPA to establish detailed group standards in specific subfields [4]. Establish product certification centers to implement mandatory certification for key UAV components, including propulsion systems and navigation modules, enhancing overall industry quality.

4.3 Expand International Markets

Implement a "standards going global" strategy, promoting China-led UAV classification standards and airworthiness regulations within the ICAO (International Civil Aviation Organization) framework. DJI's *Safety Technical Requirements for Consumer UAVs* has been adopted by 32 countries; it is recommended to expand industrial-grade standard exports on this basis, aiming to form a globally recognized "China solution" by 2030. Build overseas service networks by establishing 100 localized service centers in Belt and Road countries, providing full life-cycle services including maintenance, personnel training, and spare parts supply. XAG has established an agricultural UAV service center in Kazakhstan, training 2,000 local pilots and servicing 5 million mu annually. This model is worth replicating in Southeast Asia, Africa, and other regions.

Conclusion

Information technology has brought unprecedented opportunities to the UAV industry, driving continuous upgrades in performance, intelligence, and communication, while broadening employment prospects. However, industry development still faces multiple challenges and requires strengthened technological innovation collaboration, an improved industrial ecosystem, and proactive international market expansion. Only through coordinated efforts can the UAV industry achieve sustainable and healthy growth, enhance the competitiveness of the workforce, and, empowered by information technology, inject new momentum into social and economic development while creating greater value.

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