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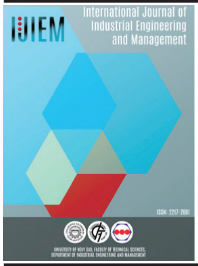

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Original research article

Kanban in Aviation Maintenance: A Case Study of a Chinese Aircraft Maintenance Enterprise

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ABSTRACT

With the rapid expansion of the Chinese civil aviation market, aircraft maintenance enterprises are under increasing pressure to improve both operational efficiency and profitability. However, many continue to rely on traditional management practices that result in inefficient workflows, poor resource utilization, and high production costs. To address these challenges, this paper presents a case study on the implementation of the Kanban method as a lean management tool within a Chinese aircraft maintenance enterprise. This study aims to explore the feasibility and effectiveness of the Kanban method in enhancing the development and competitiveness of the Chinese aviation maintenance sector. Empirical observations over a one-year period reveal that Kanban significantly improves maintenance scheduling, reduces operational costs, and enhances overall productivity. This research contributes to both practice and academia by offering practical insights and underscoring the effectiveness of Kanban as a robust management tool for enhancing operational efficiency in China's rapidly growing aviation industry.

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1. Introduction

Chinese civil aviation market has been expanding at a rate that exceeds the global average in recent years, and the resulting growth in airline fleets places substantial pressure on Maintenance, Repair, and Overhaul (MRO) providers. These organizations must shorten aircraft ground time and reduce operating costs while still meeting the stringent airworthiness regulations of the Civil Aviation Administration of China (CAAC) [1]. Many domestic MROs nonetheless rely on paper-based planning, hierarchical decision chains, and push-style scheduling, practices that obscure real-time workloads, fragment information flows, and ultimately prolong aircraft ground time and raise maintenance expenses. Several leading MROs have responded by introducing high technology solutions. AFI KLM E&M has developed advanced composite materials for repair parts and tools

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[2]; EasyJet has equipped its maintenance bases with drones to inspect aircraft for damage caused by lightning or hail [3]. Although technically promising, these initiatives require large capital investment, lengthy certification processes, and extensive workforce retraining. For low margin Chinese MROs, such barriers delay adoption and can increase organizational complexity if core management procedures remain unchanged. Consequently, there is strong interest in management approaches capable of delivering rapid, low-investment productivity gains while paving the way for future digital transformation [4].

Lean management offers a systematic alternative that emphasizes waste elimination, synchronized workflows, and continuous improvement [5]. Its central practices, including value stream mapping, pull-based task release, and visual performance tracking, have yielded significant gains in manufacturing, healthcare, and service industries [6]. Among the various tools of lean management, the Kanban method stands out as a highly effective approach to enhancing efficiency and production management. In the aviation sector, several studies have reported the application of Kanban systems to improve production planning, reduce production cost, and enhance resource utilization. Kumar BR et al. investigated the barriers to implementing and sustaining lean strategies in the aviation sector, highlighting challenges in applying tools such as Kanban and offering corrective measures through a case study and cross-industry comparison [7]. Filho et al. [8] applied lean tools and visual management principles to improve tool tracking in an aircraft assembly station, demonstrating how Kanban-inspired visual panels can reduce control time and enhance material management efficiency in the aviation industry. Agyeman [9] reviewed the Boeing production system and highlighted how lean practices, such as Kanban, contributed to production optimization and customer-focused innovation in civil aircraft manufacturing. Based on these findings, lean principles, particularly those centered on Kanban, hold strong potential for cost-sensitive MROs, offering a pathway to operational improvements [10], [11].

In India, Kolanjiappan [12] introduced the Kanban method in an aviation maintenance enterprise, demonstrating its potential to improve aircraft utilization and reduce ground parking time. Similarly, Sunjka and Murphy [13] explored the implementation of lean techniques, including Kanban, in South African aircraft maintenance organizations. Their research highlighted the successful integration of Kanban, leading to improvements in quality, reductions in turnaround times, and cost savings. However, the applicability of these findings to China may be limited due to differences in production processes and management systems. Although the Kanban method is theoretically well-suited for streamlining maintenance workflows, its practical adoption in Chinese MROs remains limited. This gap between conceptual understanding and on-the-ground implementation underscores the need for context-specific studies that address the real-world challenges of applying Kanban in Chinese aviation maintenance sector.

In response to these challenges, this paper explores the use of Kanban as an effective lean management tool within a Chinese aircraft maintenance enterprise, with the goal of enhancing the development and competitiveness of the Chinese aviation maintenance sector. Furthermore, the adoption of Kanban not only improves operational efficiency but also plays a crucial role in promoting sustainable aviation practices. By optimizing resource utilization, reducing waste, and minimizing the environmental impact of maintenance operations, Kanban contributes to green aviation. Additionally, it fosters economically efficient production, allowing aircraft maintenance enterprises to increase profitability while improving service quality. The research question proposed for this study is expressed as follows: *How can Kanban concepts be applied to promote a cultural and operational change in the maintenance practices of Chinese aircraft maintenance enterprises?* To address this question, this study adopts a case study approach, drawing on empirical observations collected over a one-year period within a Chinese aircraft maintenance enterprise.

2. Methods

The Kanban method originated from the task cards used by Toyota Motor Corporation to achieve Just-In-Time (JIT) production [14]. The term "Kanban" is derived from the Japanese word meaning "signal card" [14]. In Toyota's context, Kanban refers to a physical card that transmits production information in real-time, serving the dual purpose of visualizing project flow and identifying waste [14]. As a result, this method utilizes Kanban as a tool for facilitating the transfer of information between upstream and downstream processes.

Compared to other lean management tools such as Value Stream Mapping, Constant Work In Progress (CONWIP) and Total Productive Maintenance, Kanban offers distinct advantages in dynamic and high-variability environments like aircraft maintenance [15]. Unlike tools that require extensive system-wide redesign, Kanban is relatively easy to implement incrementally and allows for immediate visual feedback and workflow adjustment [16]. Its ability to integrate task tracking, resource coordination, and real-time workload visualization makes it especially suitable for managing complex maintenance schedules where priorities frequently shift [17]. Moreover, Kanban promotes transparency across departments and facilitates communication among technicians, planners, and supervisors, which are critical factors in reducing turnaround time and improving overall operational responsiveness [18]. While digital Kanban provide real-time visibility, they often involve higher implementation costs. In contrast, the board-based Kanban system adopted in this study offered a practical and cost-effective solution aligned with the operational needs of the enterprise.

Kanban can take various forms, including a card, a board, or a signal. In a pull control system, Kanban records essential information required for the production of the subsequent process. This information typically includes material type, quantity of materials, required equipment and tools, personnel number, and product model, among other details. The preceding process produces the necessary materials in accordance with the requirements specified on the Kanban, thus enabling pull control [19]. Consequently, Kanban acts as an information carrier and an effective tool for implementing pull-based production [20]. Based on a review of the existing literature, this paper proposes a seven-step process for implementing the Kanban method, as illustrated in Figure 1 [21].

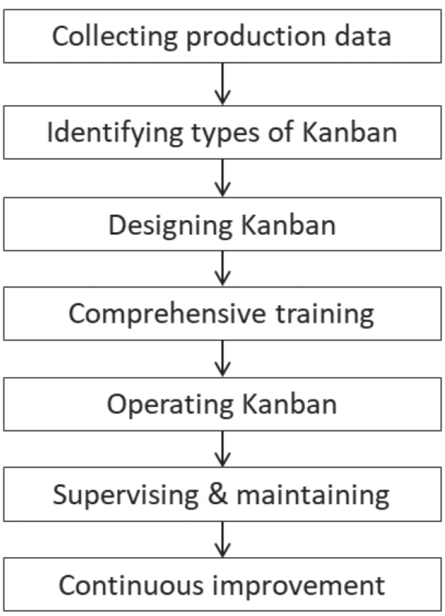

Figure 1. Processes of Kanban method

Collecting accurate production data is essential for identifying and designing the right types of Kanban. Key data points, such as customer demand, product failure rates, production efficiency, and planned downtime, should reflect the true production status. Inaccurate data can undermine the effectiveness of the Kanban method. Kanban types are classified based on their functions. The three main categories are Production Kanban, Withdrawal Kanban, and Temporary Kanban [22]. Production Kanban can be further divided into In-process and Signal Kanban, while Withdrawal Kanban is split into Inter-process and Supplier Kanban. Enterprises can design specific Kanban types based on actual production data and their unique management needs. The design of Kanban involves determining the responsible person, the frequency of data updates, and the signals on the Kanban. Both current and long-term planning data should be considered in the design. Additionally, tools like SQCDP (Safety, Quality, Cost, Delivery, and People) and 6S can be integrated to improve implementation. SQCDP helps resolve exceptions and ensures efficient transmission of production information, while 6S maintains a clean and organized work environment [23], [24]. Comprehensive training is necessary for employees to understand how to operate the Kanban system effectively and to reduce resistance to the new management approach. Training should cover not only the technical usage of Kanban, but also the underlying lean principles, communication protocols, and data interpretation [8]. By helping employees grasp the purpose behind Kanban, it becomes easier to cultivate buy-in and cooperation across departments. Employee participation is key during Kanban operation. Since operators are directly involved in day-to-day maintenance activities, they are well positioned to observe workflow delays, material shortages, or process imbalances as they occur. Their feedback provides valuable input for system refinement and continuous improvement [9]. To support this, enterprises should establish effective feedback mechanisms to collect operational insights and address emerging issues promptly. The person responsible for Kanban must report operational issues to relevant departments for timely resolution. In complex MRO settings, where maintenance tasks are interdependent and tightly scheduled, even minor disruptions can cascade into significant delays. In addition, quality management engineers should routinely monitor the effectiveness and accuracy of the Kanban system [25]. They must ensure that the information flow remains reliable and that Kanban reflect real-time status updates. The Kanban method should undergo continuous improvement to ensure long-term success. Leadership plays a critical role in fostering a culture of continuous improvement by setting clear expectations, providing incentives, and recognizing employee contributions [26]. Encouraging teams to share best practices and lessons learned also supports horizontal knowledge transfer across departments.

These seven steps of Kanban implementation are interrelated and form a continuous improvement cycle. Accurate data collection informs the selection of appropriate Kanban types, while thoughtful design ensures that the visual signals align with production realities. Training and employee engagement support the system's daily operation, and dedicated roles for oversight and reporting maintain its stability. Continuous improvement ties all steps together, ensuring adaptability in changing operational conditions. However, implementing Kanban in the aviation maintenance context also presents specific challenges, such as variability in task duration, strict regulatory requirements, and coordination across multiple specialized teams. Addressing these challenges through tailored strategies is essential to realizing the full benefits of Kanban in this complex and high-stakes environment.

3. Case study

A case study was conducted in the aircraft overhaul product department of a Chinese aircraft maintenance enterprise, which holds maintenance licenses authorized by CAAC.

3.1 Organizational hierarchy

The aircraft overhaul product department is organized into four workshops, four projects, and one office. The organizational hierarchy is depicted in Figure 2.

Workshop 1 is responsible for the maintenance of aircraft systems and is divided into three Base Maintenance (BM) sections: the mechanical section, which focuses on the fuselage, control systems, and engines; the electronic and electrical section, which handles the maintenance of electronic and electrical systems; and the service section, which manages tasks such as towing aircraft, removing and installing cover plates, weighing aircraft, and other service-related duties. Workshop 2 handles the maintenance of aircraft structural parts, while Workshop 3 is responsible for maintaining composite materials and cabin parts, which includes the composite section and the cabin section. Workshop 4 is the painting workshop, primarily focusing on the repair and renovation of aircraft surface coatings. The overhaul production of an aircraft in the aircraft overhaul product department requires the active cooperation of all four workshops, the four projects, and the office.

3.2 Process management analysis

The aircraft overhaul product department primarily conducts periodic maintenance, which includes four major checks mandated by the CAAC: A check, B check, C check, and D check. These checks vary in scope, duration, and frequency [27,28]. The A

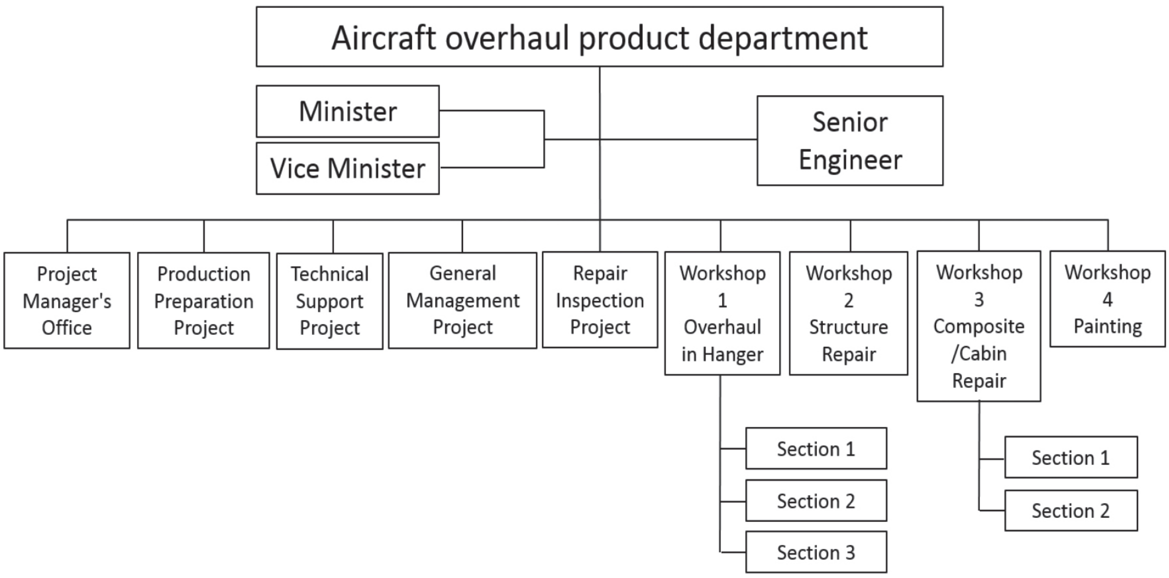

Figure 2. Organization hierarchy diagram of aircraft overhaul product department

check is performed every 65 flight hours or weekly, while the B check is conducted every 300–600 flight hours. The C and D checks are typically carried out every one to four years, respectively. The department is currently capable of performing all four checks—A, B, C, and D—and provides overhaul maintenance for six aircraft types: Airbus A319, A320, A321, A330, and Boeing B737, B757.

To manage its maintenance capabilities, the aircraft overhaul product department organizes each aircraft as a project team and implements periodic maintenance using a hybrid approach that combines project management with workshop management. The management elements of the department are illustrated in Figure 3. The integrated management subdivision is responsible for organizing project production, while the workshop production subdivision provides collaborative support to ensure the achievement of product delivery objectives.

In the collaborative production model of project teams and workshops, the composition of a project team involves the participation of members from all production departments. The structure of the project team is shown in Figure 4.

Under the leadership of the project manager (PM), all team members are involved in the entire maintenance process. Taking a specific aircraft undergoing periodic maintenance as an example, the maintenance process for the aircraft overhaul project is shown in Figure 5.

Customers issue the periodic maintenance work package to the aircraft overhaul product department through planning engineers. After receiving the work package, job-card specialists identify routine work and engineering orders. If there is any additional work beyond the work package, customers can issue it as routine work, engineering orders, or non-routine work through customer specialists. Based on the work package and any additional work, technical engineers prepare NRC (non-routine job cards) and RC (routine job cards). Team leaders from all workshops then assign production personnel to carry out the routine inspection according to the work package requirements. During the inspection, production personnel identify faults and submit requests for non-routine work, which are sent to technical engineers for the preparation of NRC. Throughout the process, inspection engineers ensure strict supervision over safety and quality.

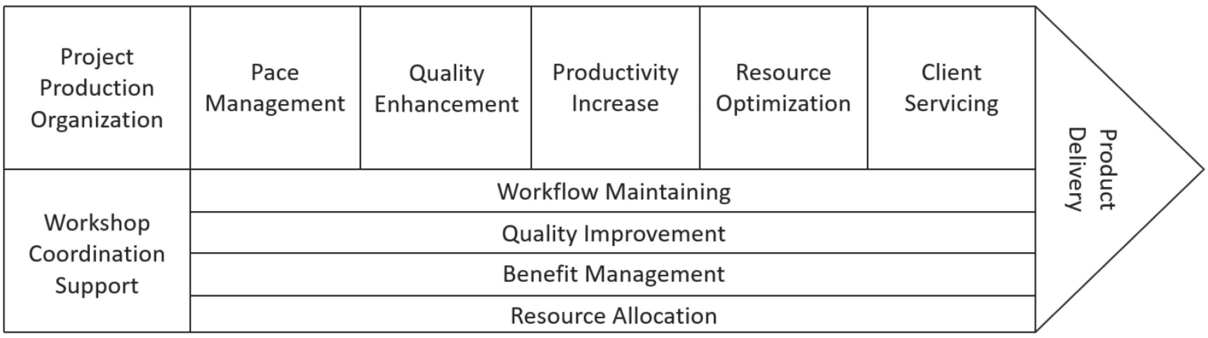

Figure 3. Distribution diagram of management elements of aircraft overhaul product department

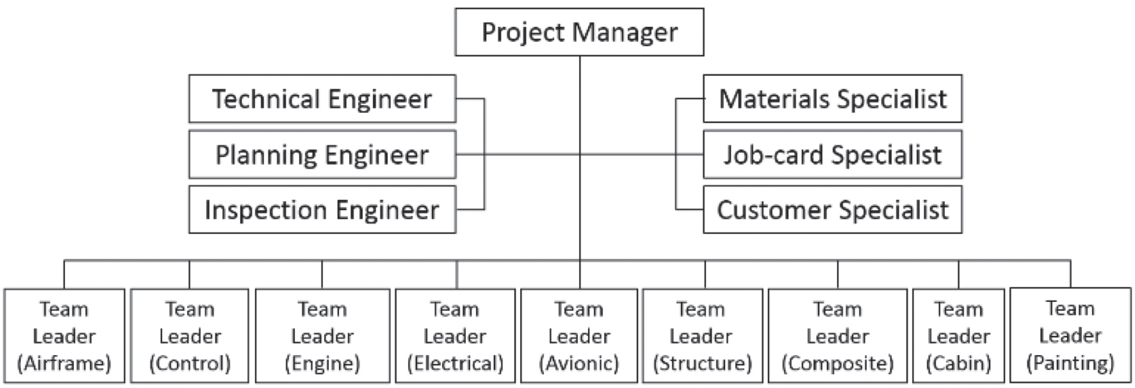

Figure 4. The structure diagram of project team

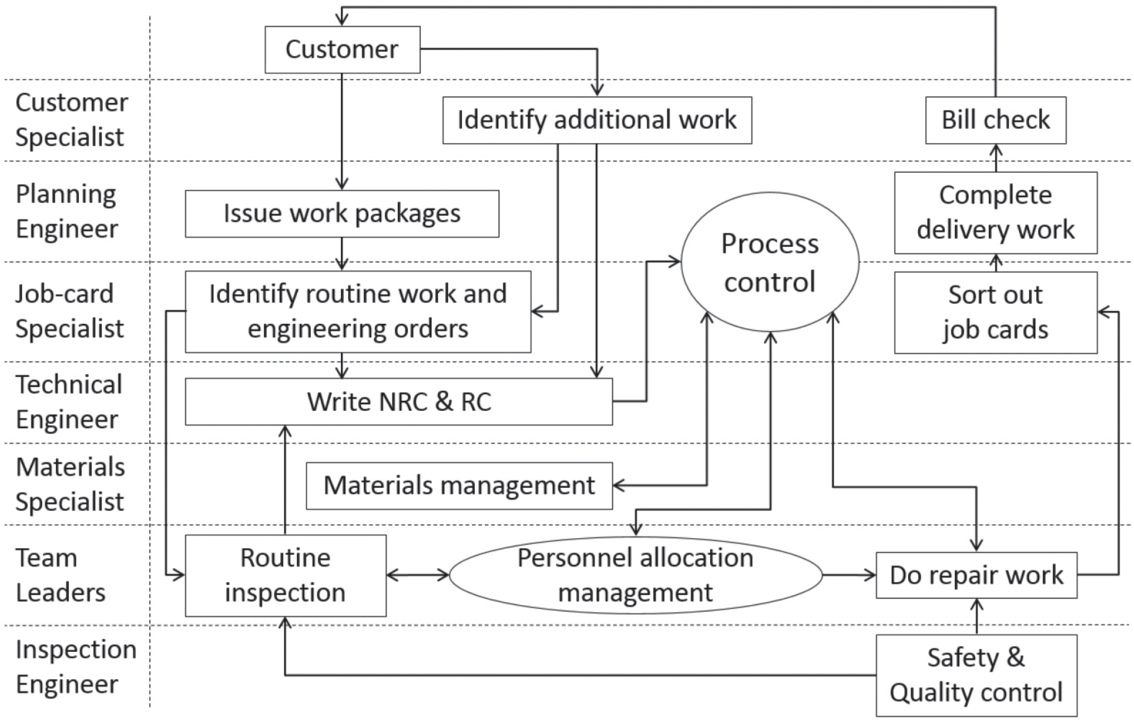

Figure 5. Maintenance flow chart of aircraft overhaul project

Following the preparation of the job cards, planning engineers and job-card specialists carefully control and manage the production schedule, while material specialists handle the requisition and return of materials based on job cards and order requirements. Team leaders assign personnel to execute the job cards according to specialty and man-hour requirements. Additionally, personnel allocation, materials management, and the execution of maintenance work need to provide real-time feedback to progress control to ensure the successful implementation of production. Once the job cards and orders are completed, job-card specialists organize all job cards and orders, planning engineers finalize the delivery, and customer specialists check the bill before submitting it to the customer. It is important to note that the entire process is overseen by the PM, ensuring proper coordination and management throughout.

3.3 Problem identification

3.3.1 Challenges in maintenance production planning

Maintenance production plans are frequently adjusted based on real-time production conditions. Issues such as faults discovered during inspections require changes in the maintenance workload, worker allocation, fault severity, and material availability. This "push" management mode can lead to inefficiencies, waste, and unnecessary use of resources, ultimately driving up maintenance costs.

3.3.2 Uncertainty in the supply of aviation materials

There is often uncertainty in the availability of aviation materials, especially for non-routine tasks outside the scope of standard maintenance. Material specialists must source the required materials from internal inventories or external suppliers. The procurement process involves time and cost considerations, along with comparing prices from different suppliers, which introduces additional uncertainty into the material supply process.

3.3.3 Weakness in the information management system

The current information management system lacks robust functionality, making it difficult to track the progress of job cards or orders as they move between departments. This can lead to miscommunication, delays, and conflicts both between departments and within the same department, ultimately affecting the cost, efficiency, and quality of aircraft maintenance.

3.4 Kanban design

Based on the production characteristics of the aircraft overhaul product department, this study designs three tailored Kanban tools to improve operational efficiency and coordination: the Personnel Allocation Kanban, the Project Management Kanban, and the Production Control Kanban. The latter two are subdivisions of the Production Kanban, each serving distinct but complementary functions. Specifically, the Project Management Kanban enhances planning accuracy and cross-functional coordination; the Production Control Kanban improves workflow efficiency and facilitates delay management; and the Personnel Allocation Kanban enables flexible and efficient workforce distribution. Collectively, these Kanban tools contribute to enhanced productivity, adaptability, and operational transparency within the department.

3.4.1 Personnel Allocation Kanban

Personnel Allocation Kanban is primarily responsible for conveying the information regarding the production personnel in each section of the aircraft overhaul product department, thereby optimizing the management of personnel allocation across sections. Since Workshop 1 has the largest number of personnel and accounts for the highest proportion of the total workload, this study has established the Personnel Allocation Kanban exclusively for Workshop 1. According to the division of sections, this paper designs the following three types of Personnel Allocation Kanban. Figure 6(a) shows the Personnel Allocation Kanban for Section 1, Figure 6(b) shows the Personnel Allocation Kanban for Section 2, and Figure 6(c) shows the Personnel Allocation Kanban for Section 3. The overall design approach for these three Personnel Allocation Kanban is the same, but due to the distinct personnel management characteristics of each section, the details of the Kanban design differ. In general, the content of the Personnel Allocation Kanban is divided into seven parts: aircraft number (AC No.), work category, work content, area head, list on aircraft (list on AC), personnel attendance (including business travel, training, ask for leave, night shift, rotate days off), and document bulletin. The area head for Section 1 is further categorized into three specialties: Fuselage (F), Operation control (O), and Powerplant (P). The area head for Section 2 is further categorized into two specialties: Avionics (AV) and Electrical (E).

3.4.2 Project Management Kanban

Project Management Kanban is an effective tool for conveying production management information across various projects and plays a crucial role in implementing pull-based production. Based on the current project management status of the Aircraft Overhaul Product Department, this study divides the content of the Project Management Kanban into four parts: on-site management tools, production elements, maintenance stages, and issue announcements, as shown in Figure 7.

The on-site management tools include SQCDP and 6S. The production elements include the number of milestones, job cards, NRCs, materials, manhours, additional work, and personnel. The maintenance stages include approach, paint off, disassembly, check, repair, assembly, paint on, test, and delivery. To better represent the daily production status, the five elements of SQCDP and 6S in the Project Management Kanban are evenly divided into 31 parts, each representing one day of the month. PM uses red, yellow, and green markers each day to indicate the actual status of the five SQCDP elements and 6S for that day. Red indicates that the standard has not been met, yellow signifies potential risks, and green indicates that the standard has been achieved. In addition, to highlight the discrepancies between actual production conditions and the production plan, the daily data columns for each production element in the Kanban are divided into two parts by a diagonal line. The left side represents actual data, while the right side represents planned data. If there is no data for a particular element on a given day, both sides are marked as “N/A”. Furthermore, the data for each production element can change daily, with both actual and planned data subject to modification.

3.4.3 Production Control Kanban

Production Control Kanban serves as an effective tool for conveying comprehensive production management information and identifying risk factors across all projects. It facilitates the centralized management of production progress for all aircraft. To support timely updates by project managers and enhance oversight by the production director over the activities of the Aircraft Overhaul Product Department, a dedicated Production Control Kanban was designed and installed in the project managers’ office. This Kanban consolidates key information from individual Project Management Kanban, enabling

Daily Arrangement of Manpower

BM 1st Section

Date: ____________ On duty: ____________

AC No.																Document bulletin
Work Category																
Work Content																
Area Head	F	O	P	F	O	P	F	O	P	F	O	P	F	O	P	
List on AC																
Business Travel	Training			Ask for Leave			Night Shift			Rotate days off						

(a) Personnel Allocation Kanban designed for Section 1

Daily Arrangement of Manpower

BM 2nd Section

Date: ____________ On duty: ____________

AC No.	Work Category	Work Content	Area Head		List on AC	Document bulletin
			E			
			AV			
			E			
			AV			
			E			
			AV			
			E			
			AV			
			E			
			AV			
Business Travel	Training	Ask for Leave	Night Shift		Rotate days off	

(b) Personnel Allocation Kanban designed for Section 2

Daily Arrangement of Manpower

BM 3rd Section

Date: ____________ On duty: ____________

AC No.	Work Category	Work Content	Area Head	List on AC	Document bulletin
Business Travel	Training	Ask for Leave	Night Shift	Rotate days off	

(c) Personnel Allocation Kanban designed for Section 3

Figure 6. Personnel Allocation Kanban designed for Workshop 1

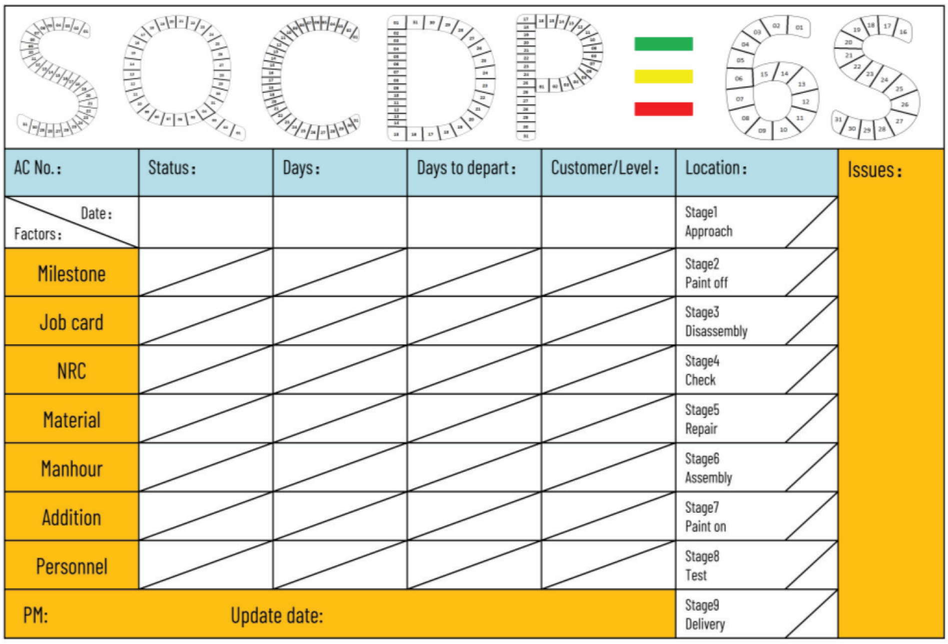

Figure 7. Project Management Kanban designed in this study

the Aircraft Overhaul Product Department to maintain integrated control over all ongoing projects, as illustrated in Figure 8.

3.5 Operating requirement

Section leaders are responsible for updating the Personnel Allocation Kanban daily. Each morning, project managers convene with their team members in front of the Project Management Kanban to conduct a Kanban meeting, during which the daily production plan is issued and Kanban data are updated. In addition, project managers are required to update the data on the Production Control Kanban each morning to facilitate the production director's oversight of the overall progress within the Aircraft Overhaul Product Department. All information on the Kanban is recorded manually, allowing for flexibility in day-to-day management.

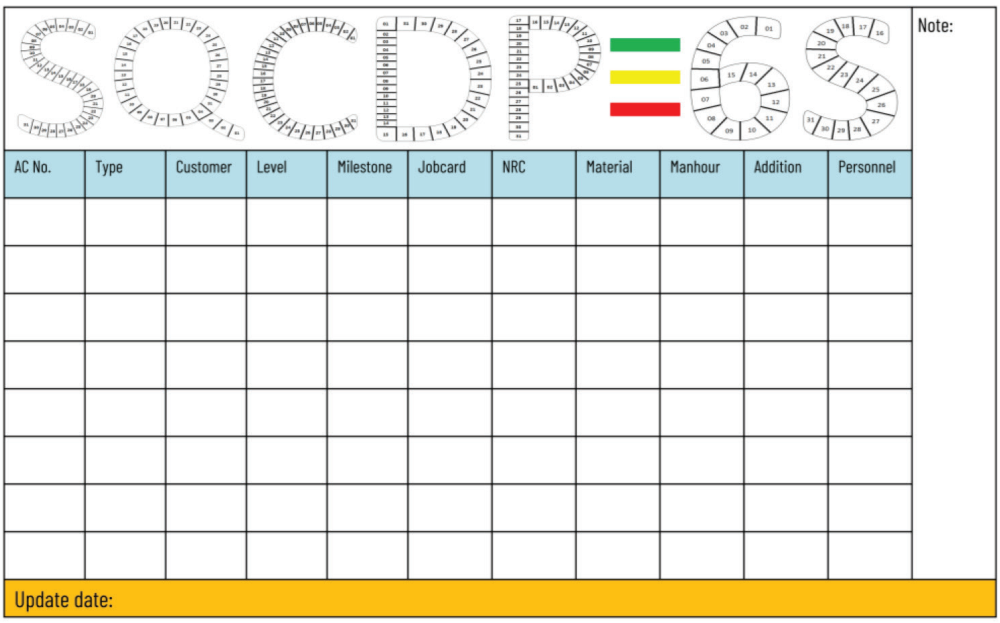

Figure 8. Production Control Kanban designed in this study

4. Results and discussion

Prior to the formal implementation of the Kanban method, all personnel in the Aircraft Overhaul Product Department underwent a two-week training program to facilitate the smooth integration of the Kanban method into daily production activities. After one year of Kanban implementation, the department achieved significant improvements across multiple domains.

In terms of benefits management, the first month was treated as a transitional period due to anticipated challenges in the initial application of the Kanban method, which affected production outcomes. Therefore, benefit-related data from this initial month were excluded from the analysis. This study presents the benefits data from the remaining 11 months to highlight the improvements in benefits resulting from the adoption of the Kanban method, as illustrated in Figure 9.

In Figure 9, the horizontal axis denotes the month number after Kanban implementation, while the vertical axis shows the average monthly benefit (in ten thousand Yuan). A pronounced dip appears in September due to reduced output caused by high temperatures. The dashed line illustrates the overall trend, revealing a gradual increase in average benefits. Quantitatively, the average monthly benefit increased by approximately 15% over the implementation period. This result suggests that the Kanban method contributes positively to the economic performance and operational benefits of the Aircraft Overhaul Product Department.

In terms of production efficiency, notable improvements were observed in several projects after one year of Kanban implementation. These include the 4C check and Wi-Fi retrofit of Airbus A320, the 3S System paint stripping of Airbus A321, and the 4C check of Airbus A330, as shown in Table 1. Among them, the Wi-Fi retrofit project of Airbus A320 achieved the most significant improvement, with a three-day reduction in turnaround time.

With respect to Aircraft Count (ACC) and Maintenance Downtime (MD), the introduction of the Kanban method generated marked gains within the Aircraft Overhaul Product Department. A comparative analysis of C-check and Directive-task records for the 12 months before and after Kanban implementation shows a substantial rise in both ACC and MD in the post-implementation year, as shown in Table 2. These results indicate that the Kanban method has exerted a demonstrably positive impact on the annual production capacity of the Aircraft Overhaul Product Department.

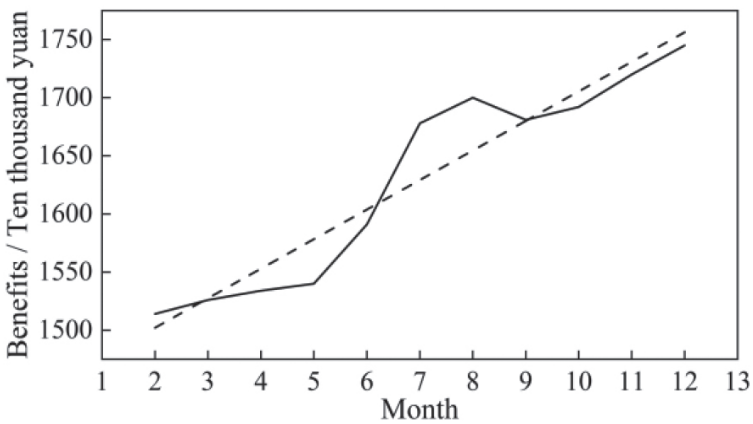

Figure 9. Analysis of benefits in the Aircraft Overhaul Product Department following the implementation of the Kanban method

Table 1. Turnaround Time for Selected Projects in the Aircraft Overhaul Product Department

Project	Initial Duration (days)	Current Duration (days)
A330 - 4C Check	25	23
A320 - Wi-Fi Retrofit	7	4
A320 - 4C Check	11	9
A321 - 3S System Paint Stripping	12	10.5

Table 2. Aircraft count and maintenance downtime metrics in the Aircraft Overhaul Product Department

Period	Aircraft type	C-check ACC	C-check MD	Directive-task ACC	Directive-task MD	Total ACC	Total MD
Pre-Kanban	Airbus A320 series	21	798.5	7	75.5	28	874
	Airbus A330 series	0	0	3	40	3	40
	Boeing B737 series	2	30	2	18	4	48
	Boeing B757 series	10	211	8	681	18	892
	Total	33	1039.5	20	814.5	53	1854
Post-Kanban	Airbus A320 series	48	713	8	518	56	1231
	Airbus A330 series	6	109	2	32	8	141
	Boeing B737 series	7	60	0	0	7	60
	Boeing B757 series	21	611	7	534	28	1145
	Total	82	1493	17	1084	99	2577

Since working efficiency can be represented by the ratio of planned working hours to actual working hours, and both values are recorded on the Kanban, this study analyzed the monthly average working efficiency of production personnel after the implementation of the Kanban method, as shown in Figure 10. The dashed line illustrates the overall trend in working efficiency. Although a decrease was observed in July due to a concentration of annual leave requests, the monthly average working efficiency generally showed an upward trend over time. This improvement contributes to enhanced productivity across the Aircraft Overhaul Product Department and reflects the optimization of project-related production information management [4].

This study contributes to the lean management literature by demonstrating the applicability of the Kanban method in the complex and regulated environment of aircraft maintenance [15]. It shows that visual pull-based tools can be effectively used not only in manufacturing but also in service-oriented settings like MROs. Practically, the case study highlights that Chinese MROs can achieve notable improvements in turnaround time, personnel efficiency, and workflow coordination through Kanban. These findings offer actionable insights for MROs seeking low-cost, incremental improvements [18].

The main strength of this study is its use of real-world, longitudinal data to evaluate the impact of Kanban over time. The comparison between pre- and post-implementation performance provides clear evidence of its operational benefits. However, as a single-case study focused on one Chinese aircraft maintenance enterprise, the findings may not be fully generalizable to all organizational or cultural contexts. With appropriate adaptation, similar systems may be applied in other workshops or maintenance departments of different scale and complexity. Currently, the Kanban system implemented in this study is board-based, relying on physical visual

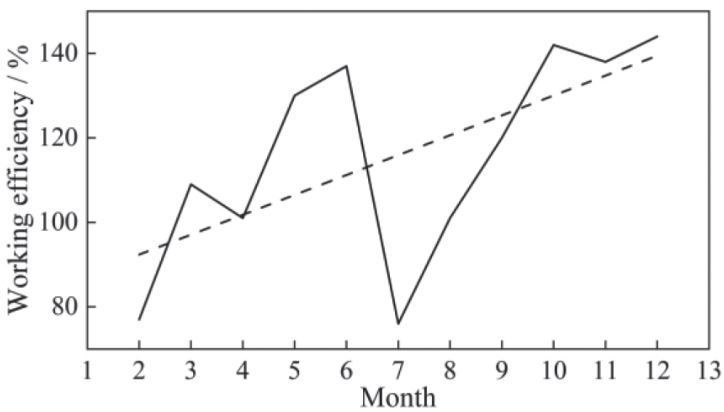

Figure 10. Monthly average working efficiency of production personnel in the Aircraft Overhaul Product Department after the implementation of the Kanban method

management tools. In future work, digital solutions such as e-Kanban or web-Kanban systems could be considered to enable real-time data updates, enhance information transparency, and facilitate integration with enterprise resource planning systems [29], [30]. Additionally, due to confidentiality restrictions, direct photographs or original records of the Kanban boards could not be disclosed. To partially mitigate this limitation, schematic templates are provided as generic representations, which other aviation maintenance organizations may use for reference.

5. Conclusions

For answering the research question, this study developed and implemented three tailored Kanban tools for the Aircraft Overhaul Product Department: the Project Management Kanban, Production Control Kanban, and Personnel Allocation Kanban. Based on one year of post-implementation data, the results confirm the applicability and effectiveness of the Kanban method in aviation maintenance management. Key improvements include a steady increase in average operational benefits, reduced turnaround times for several major projects, and a general upward trend in the monthly working efficiency of production personnel. Total aircraft count and maintenance downtime also increased notably after implementation.

In addition to its practical value for the aviation field, this study contributes to the academic literature by demonstrating how Kanban can be adapted to complex, high-reliability service environments through a real-world, longitudinal case. Future research may focus on integrating digital Kanban systems with real-time monitoring and expanding validation across diverse maintenance scenarios. Such efforts will further support the development of lean, efficient, and sustainable practices in the aviation industry.

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