Study on the Supply Chain-based Spare Store Management in the Military

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Abstract: The shortage and backlog of aviation materials have increasingly plagued the development of our aviation materials, especially in recent years. With the continuous expansion of the fleet, if the issue of spare parts for aviation materials is not effectively handled, it will inevitably affect the safety of the flight of the army or cause a huge backlog of inventory. The use of large amounts of liquidity has affected the effective use of military expenditures. Therefore, a set of scientific forecasting and management methods is particularly important. Only by combining the application of modern management theory and the characteristics of the military aviation material support in the new period can our army construct a safeguard strategy with military characteristics, establish a model suitable for our military aviation material support, and effectively achieve the purpose of improving the aviation material security rate and reducing the cost of aviation material management. In order to realize the unity of military and economic benefits aviation material management. At present, the single forecasting model for the demand of aerospace materials has a relatively mature theory, such as Poisson model, progressive normal model, etc. However, there are few mature theories for the optimization of the spare parts system, and the research on the theory and method of control of aviation materials is very weak. Based on the present situation of military aviation materials management, this paper analyzes the main problems in military aviation materials management, applies modern supply chain management theory, establishes the military aviation materials supply chain management structure, and chooses the inventory control strategy suitable for military aviation materials inventory management.

1. Introduction

Aviation materials, also known as aviation equipment, are the customary names of employees for aviation products and their parts. Aviation products generally refer to aircraft, Aerial engines, and propellers. Parts and components refer to any material, instrument, machinery, equipment, parts, components, components, accessories, and communications equipment used or to be used and installed in aviation products. It is what we call the voyage material. In recent years, our army has introduced a small number of advanced combat aircraft from abroad, but most of the aircraft equipped with troops come from domestic aircraft manufacturers. Therefore, most of the supply of aviation materials comes from domestic manufacturers, and very few military aviation materials come from abroad. The goal of the military aviation security is to allow more aircraft to participate in military training or combat. Its goal is to pay more attention to military efficiency, focus on the completion of military tasks, and have a stronger mission. The management of military aviation materials is somewhat backward compared to civilian aviation materials, and the traditional management system is still used. The management theory is old and the technical means are backward. Information and resources can’t be shared. Civil aviation is based on the international Internet, guided by advanced supply chain management ideas, and uses modern technology as a management tool [1]. The supply chain structure is relatively mature and the management platform is wide.

Flight safety is the lifeline of China's aviation forces, so ensuring the quality and timely supply of aviation materials has always been a prerequisite for the implementation of safety management by aviation units and the ultimate goal of the military's aviation material support, in order to ensure

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the timely supply of aviation materials. For a long time, our aviation materials management department has been using the safeguard mode of "physical supply and unlimited supply" to prevent aircraft from being affected by the timely supply of aviation materials to the completion of flight training or combat missions, or even the occurrence of flight accidents. This kind of safeguard mode has taken up a large amount of liquidity because of the excessive stock of aviation materials. It can no longer meet the requirements of our military's aviation materials protection in the new period.

Along with the development of the world aviation force, the management of military aviation materials has been promoted with the extensive application of network information technology in recent years. Information network technology is a very important factor in the support of aviation materials in recent years. Our army also carried out a lot of work in developing its own aviation material management information system and began to take shape. The Air Force Aviation Material System has now popularized the military, established a corresponding website for the military local area network, and developed online application software for the aviation material business. The Air Force rear materials warehouse and station materials unit have established the aviation materials management information system [2]. The development and application of the network system has laid a deep foundation for the network, modernization of the aviation material management system.

2. Analysis of Aviation Material Management Mode

The military aviation material management model is a chained inventory management structure. The chain management structure refers to the need to transmit feedback from the next level to the next level, complete the demand for orders from the highest level, and then distribute it to other subordinate units. This strategy is determined by the influence of the structure of the ship warehouse. The system of aviation material inventory is linear model, and the management model of aviation material inventory can only be linear model.

The inventory structure of our army is commonly used in the three-level maintenance library structure. Different levels correspond to different requirements for the quantity and type of inventory of aviation materials. The information flow of the aviation stock is transmitted from bottom to top, and the transmission and feedback are carried out at the first level. The demand is first determined by the lowest level according to the forecast, transmitted to the relay level, and the relay level combines the requirements of the next level and its own needs to the highest level. The highest level ultimately determines the total amount and type of demand. The physical logistics of the aviation stock is from top to bottom. After the highest level of ordering requirements and completing orders, the inventory is sent to various levels of storage management According to different needs [3].

The chain management structure is shown in Figure 1.

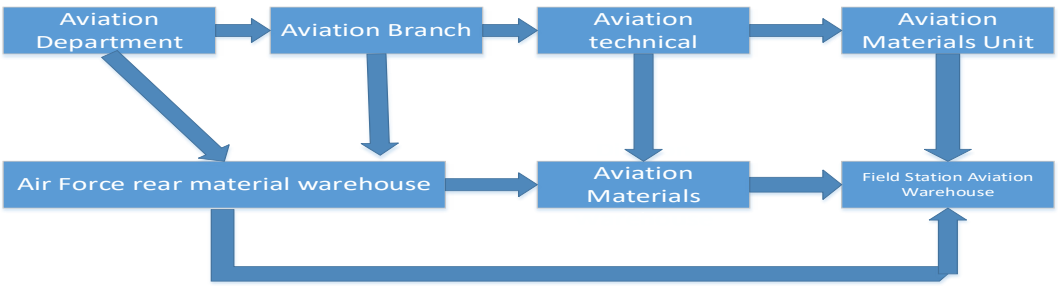

Figure 1 Chain management structure chart

3. Problem

At present, when the aviation materials are out of stock at the grassroots level, the demand for stock will be sent up step by step. Due to too many management departments and long information processing processes, the inefficient transmission of information and the poor effect of the supply

chain will be caused. In addition to the general storage costs, the inventory of aviation materials also includes the cost of daily maintenance of the inventory of aviation materials and the cost of maintaining the normal operation of the inventory system [4]. As a special material, the military benefit is more important than economic benefit. In order to avoid the shortage of aviation materials at all levels, the aviation stocks are stored in excess of the actual demand, resulting in excessive inventory. For example, because of its necessity, the tires of aviation aircraft must have sufficient stock in every place, but many tires have not been used after they have exceeded their life span. But it has to be done, and we all know that when a Tyre exceeds its life value, it will significantly reduce the value of the recycling and it will be almost zero. This increases the purchase and maintenance costs of aviation materials and wastes unnecessary manpower. Although the focus of the inventory of aviation materials is to meet the higher guaranteed rate of aviation materials, the problem of high cost still needs to be paid attention.

In the course of aircraft maintenance, it is impossible to meet the safety of aviation materials. Therefore, the aviation materials management department should determine a reasonable rate of aviation materials protection. The traditional idea is that the higher the guaranteed rate, the better, but in fact, the higher the guaranteed rate of guaranteed material, the more the cost than the reasonable guaranteed rate. The normal guaranteed rate of aviation materials refers to the ratio of the number of flight materials that can be solved immediately from the unit's warehouse before the aircraft stops due to lack of parts and the number of applications for the use of aviation materials made by the maintenance department [5]. The guarantee rate of aviation materials is an important index to measure the level of aviation materials protection. The higher the guarantee level, the more stocks of aviation materials are, the higher the inventory funds are.

4. Construction of Supply Chain Management Structure for Aviation Materials

Aviation supply chain management refers to a new type of aviation material protection model that integrates the suppliers of aviation materials with the military aviation material management department, third-party logistics management enterprises, and the final support object through feedback logistics and information flow. It is driven by the needs of the guaranteed objects, based on information sharing, emphasizing strategic management and focusing on coordination between chains. Through internal information integration and external information interconnection, the aviation supply chain will incorporate direct and indirect departments related to the aviation material support business into the interlocking supply chain, so that multiple departments can achieve coordinated operations under an overall information system management. Decentralized plans for these sectors are integrated throughout the supply chain to form a coherent supply chain plan. This networked and integrated aviation material support model removes the walls of individual departments, connects independent information islands of each department, integrates the previously separated business processes through the network, and covers the entire process from the supplier to the support object. Through coordination and cooperation, departments can improve the performance of the entire supply chain and achieve the minimum operating cost of the entire supply chain [6].

The purpose of establishing the supply chain management structure is to solve the key problems existing in the traditional inventory management of aviation materials. The key problems brought about by the traditional management model are the length of the line, the long information transmission path and the slow response speed. Therefore, the principle of establishing the supply chain management structure is to minimize the number of nodes in the supply chain, shorten the demand of the supplier and the first-line material, and realize the information sharing and direct delivery of the material under the condition of ensuring the realization of the functions of the supply chain. Secondly, in the light of the current reform of the military logistics supply system, we should adopt the multi-channel security model of combining the three armed forces, combining military and civilian forces, and integrating military and civilian forces into the civilian population, and hand over the business of supporting aviation materials to local mature logistics enterprises for operation in order to share the pressure of military aviation materials protection. To enable the army to

concentrate its efforts on military training in order to improve it's operational capabilities[7]. According to the definition of the supply chain management of aviation materials and the principle of establishing the supply chain management structure of aviation materials, the supply chain management structure of aviation materials as shown in the figure is established. Its supply chain structure consists mainly of the following members:

4.1. Aviation Suppliers

According to different types of aviation materials, different aviation materials suppliers are identified. The aviation suppliers here are mainly aircraft manufacturers of various models or aircraft manufacturers. For some general types of aviation materials, their suppliers are not unique and should be determined on the basis of a comprehensive assessment.

4.2. Military Aviation Distribution Center

The military air material distribution center is a comprehensive department integrating the functions of air material forecast, plan formulation and approval, air material ordering and purchase, air material inventory management, financial management, air material distribution and transportation. According to the strategic requirements of national defense, a comprehensive demonstration and decision-making, a number of aviation materials distribution centers are established in important strategic defense areas. Each aviation materials distribution center consists of a number of aviation materials support brigade maps, which are interconnected through the network to achieve information sharing and resources sharing. The establishment of the aviation material distribution center will completely break the system of management of aviation materials by the military and arms, establish a unified aviation material distribution network for the entire army, achieve the sharing of aviation materials resources, and meet the needs of the military aviation material protection with the least inventory of aviation materials[8].

The distribution mode of military aviation materials is shown in Figure 2.

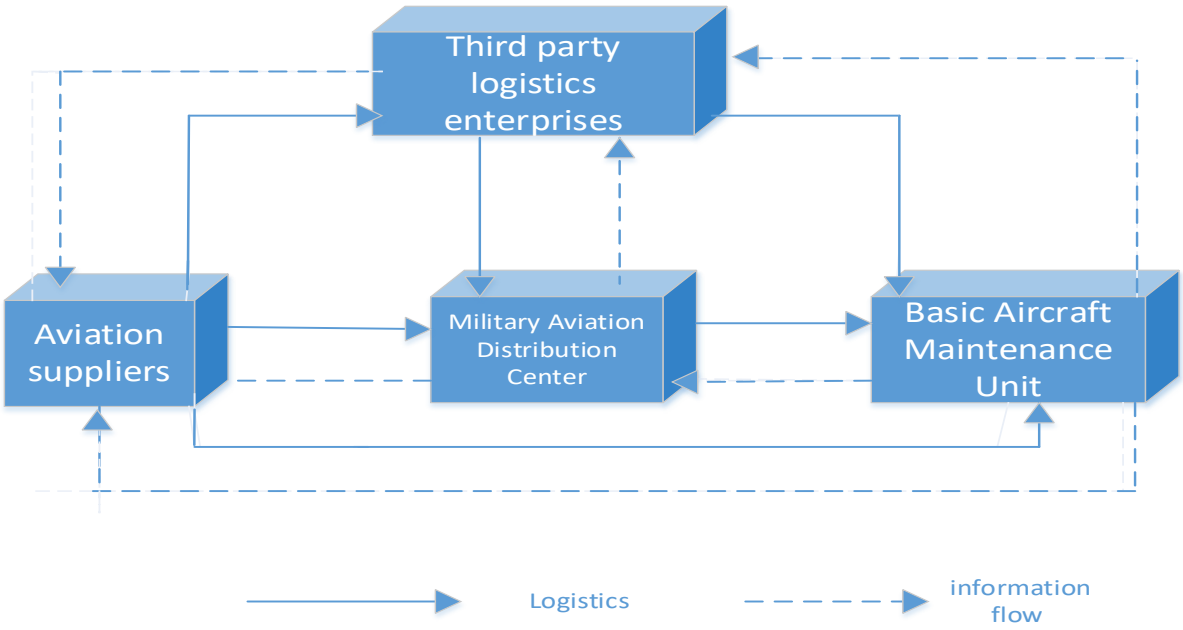

Figure 2 Military air material distribution picture

4.3. Third party logistics enterprises

For some expendable aviation materials, it has a strong commonality with civilian aviation materials. It is possible to transfer the inventory business of such aviation materials to local logistics enterprises that are independent of the military, which can reduce the pressure on military aviation materials. Make the army committed to the improvement of the core military combat capabilities. Considering that military materials are military materials that have a certain degree of

confidentiality. In order to do a good job in preventing leaks, when selecting third-party logistics enterprises, the main consideration is to consider professional logistics companies that are independent from large aviation industry groups, or aviation companies established by civil aviation transportation companies, Enact accountability with them to enhance training as much as possible and improve their rapid response capacity to meet the specific requirements for the transportation of military materiel.

4.4. Basic Aircraft Maintenance Unit

The basic aircraft maintenance unit mainly refers to the first-line maintenance Department of machinery, which should establish information sharing network system with aviation material suppliers, aviation material distribution centers, and third-party logistics companies to achieve the sharing of aviation materials inventory, demand, forecast, and supply information. In the above supply chain, according to the demand of aviation materials, each member coordinates and cooperates with each other to keep a certain amount of aviation materials inventory to meet the needs of military aviation materials protection [9].

The structure of military aviation equipment distribution center is shown in Figure 3.

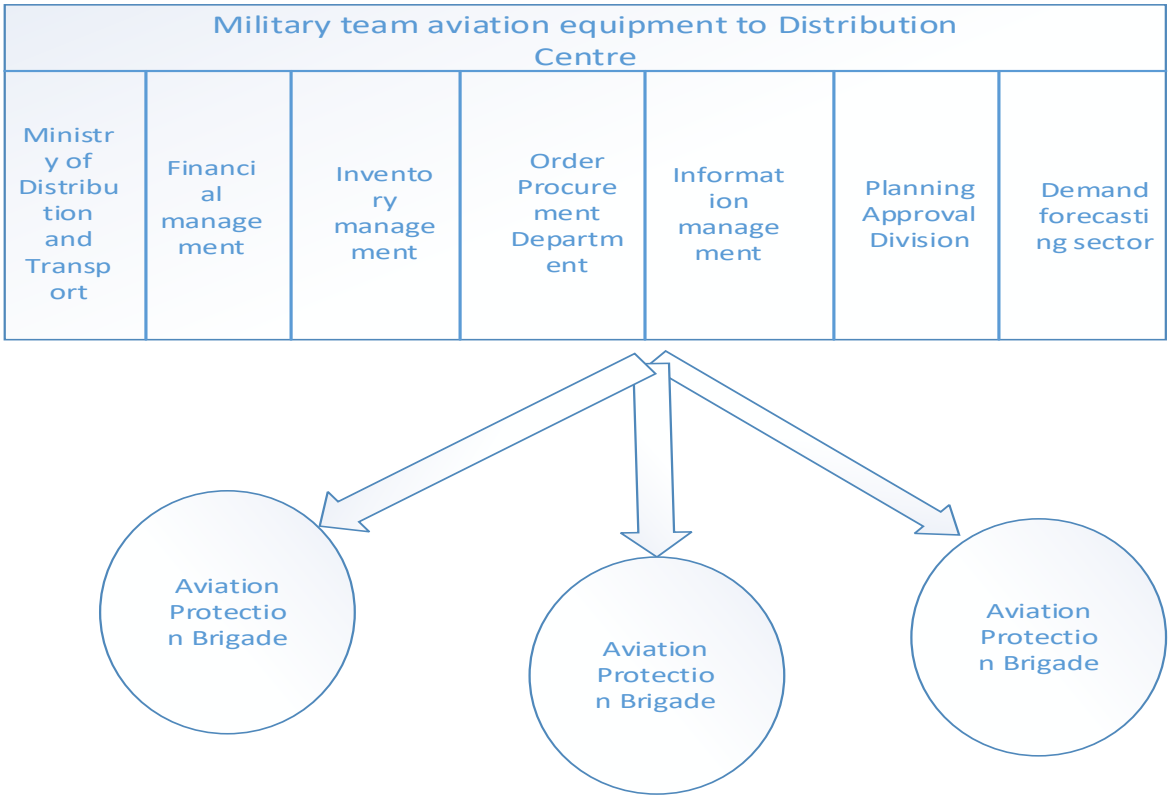

Figure 3 Military Aviation Equipment to Distribution Center

5. Summary

China is already a well-deserved aviation power, but it is still far from being an aviation power. The integration of the military aviation material support field and the background of the times under the current major environmental factors, and the pace of the technological wave, will help China complete this transformation. With the rapid and steady development of the Chinese economy, the size of the Chinese fleet and the reserves of aviation materials will continue to grow significantly. In today's age of big data, we can’t rigidly adhere to the old forms of the past, introduce the concept of new big data, use the theory of cooperative governance as the core idea, and use data mining as a tool to change the traditional pattern of decentralized security. It is urgent to improve the concentration of the industry and to build a data-oriented aviation security system. This paper

analyzes the present situation of aviation materials management and modern aviation materials security management, analyzes the problems existing in aviation materials security management, applies the thought of supply chain management to aviation materials inventory management, and constructs the structure of aviation materials supply chain management. It is feasible in military, technical and economic aspects.

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