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Research on Common Market Competitiveness of Civil Aircraft

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Abstract: With the continuous development of science and technology, it has driven the development of China's civil aircraft industry. At present, China's aircraft manufacturing process is basically a model established by advanced science and technology, simulation design, design definition, and data processing according to the established model, so as to create a real aircraft physical. In recent years, the civil aircraft manufacturing industry has been widely used, and the aircraft manufacturing industry is also intensifying market competition. The article conducts an in-depth analysis of the improvement of the competitiveness of civil aircraft design and manufacturing.

1. INTRODUCTION

The continuous development and improvement of aviation technology has caused some civil aircraft to gradually expose its drawbacks. Its high manufacturing cost, low operating efficiency, and poor manual technology have proposed some improved designs, using digital design techniques to improve the performance characteristics of civil aircraft and increase Market competitiveness.

2. ANALYSIS OF PROBLEMS IN AIRCRAFT MANUFACTURING

2.1 PROBLEMS IN THE APPLICATION OF ANALOG TECHNOLOGY

Simulation technology plays an important role in the development of aircraft. It needs to be used from the initial product design and needs to exist in the whole process of production. However, most of the problems found so far appear in the application time. During the development of the aircraft, the time has not been coordinated with each link, ignoring the importance of the initial design of the aircraft to the simulation, so it is prone to problems such as time errors^[1].

In the research and development of civil aircraft, it is necessary to coordinate with the staff of product design, tooling design, process design and other aspects to cooperate with each other to carry out the flow engineering and improve the waste in working hours. However, as far as China is concerned, it has not achieved the above model of mutual cooperation. It also needs to draw more valuable experience from foreign development and quickly lay the foundation for aircraft manufacturing in light of the situation of Chinese enterprises. In addition, the digital design and simulation technology of China's aircraft manufacturing industry itself has a certain degree of deficiencies, but also needs to focus on and increase the innovation power of technology. At present, the most used software for civil aircraft in the world is the DELMIA software of Sony Corporation of Japan. This software is widely used, but there are still some shortcomings. For example, this software



does not have the gravity simulation technology, and the three-dimensional software in the simulation is simulated. In the simulation, the rigidity and flexibility of the applied components cannot be reflected positively. Therefore, when using the DELMIA software, it is still necessary to analyze the defects generated by the software to reduce errors in the design. In actual work, the simulation simulation is usually only determined by the technician's work experience and products. The integration of digital design and simulation design application is not established, and the results are inconsistent, which seriously affects the quality of aircraft simulation manufacturing. Therefore, in the design and production process, it is necessary to formulate a certain standard of the standard system, in accordance with the corresponding standards, from the beginning of the design will be unified implementation^[2].

2.2 PROBLEMS IN USING THE SYSTEM FOR SIMULATION

In aircraft manufacturing, the systems used are quite different, and it is very easy to change the effect. Therefore, when expanding the application range of digital technology applications, it is necessary to rationally design the system interface and provide technical training for the staff to improve the practicality and safety of digital design systems.

2.3 FIELD DATA COLLECTION AND FEEDBACK ISSUES

The most important work in the design is the data collection and feedback of the on-site environment, which can provide an effective basis for the next work, real-time monitoring of the on-site production process, and develop a reasonable manufacturing plan and arrange a reasonable manufacturing progress, but currently The application of the civil aircraft manufacturing application system does not have this function, so it is not possible to fully realize the data collection of the on-site environment. The digital management system software has not been popularized in civil aviation enterprises, and paper data reports are still used, which are prone to loopholes or the information is wrong, and the product data cannot be uniformly divided. At present, many measurement softwares can directly generate tables and apply them to the system, which can store data and provide guidance for future design quality monitoring and safety production^[3]. Field data acquisition and feedback calculation methods such as Equation 1

$$b_1 = \frac{\sum_{i=1}^t (X_i - \bar{X})(Y_i - \bar{Y})}{\sum_{i=1}^t (X_i - \bar{X})^2} = \frac{\sum_{i=1}^t (X_i - \bar{X})Y_i}{\sum_{i=1}^t (X_i - \bar{X})^2} \quad (1)$$

3. THE SIGNIFICANCE OF DIGITAL DESIGN AND MANUFACTURING

Digital design is generated based on the support of multiple forms of media to meet the needs of users. A system of digital design and manufacturing that integrates virtual displays, computer networks, databases, and multimedia under one system to meet user needs. Unified analysis, unified planning and unified organization of product information, process information and resource information, to achieve rapid production of the entire design and manufacturing process to meet user needs. The vigorous development of the civil aircraft manufacturing industry has also led to the continuous development of computer technology, manufacturing design technology and information management technology. Therefore, digital design and manufacturing is the development trend of the modern civil aircraft manufacturing industry^[4].

The use of digital design technology by civil aircraft manufacturers can effectively enhance the competitiveness of enterprises, combine other related technologies, integrate digital design with computer and network information, and then use database platform to complete the design and manufacture of aircraft. It can be seen that the development of the civil aircraft industry needs to focus on science and technology, to improve the goal of aircraft design, manufacturing, management and after-sales service, to fully implement the digital management process, to establish a digital design and

manufacturing system, and to fully realize the civil aircraft manufacturing. The true digital meaning of the industry. The traditional design method of the aircraft manufacturing industry goes from concept design to preliminary design, and finally to the three stages of production design. Each stage has relevant design drawing models. The staff needs to design the internal configuration of the aircraft according to the corresponding prototype of the model. The technologies integrated in the aircraft manufacturing industry have taken advantage of advanced science and technology and improved the overall economic operations of the company.

4. CIVIL AIRCRAFT COMMONALITY ANALYSIS

Commonality refers to the design of two or more models from design concept to design standard specification, from the matching of general parts to the assembly of large parts, from spare parts support to field support, in the same way or in the same way. Interoperability in manufacturing, assembly, forensics, services, etc., with a view to reducing design and usage costs and improving efficiency. Mainly include: the commonality of the models in the series, the commonality of the models in the series and the commonality with the competitive models. The ultimate goal of aircraft development for common work is to create more value for aircraft manufacturers and users, mainly in:

a) For the manufacturer, the same body design reduces design and development costs, and also speeds up the airworthiness forensics cycle; the same tooling process reduces manufacturing costs; and the same system and components reduce supplier selection costs.

b) For customers, reduce customer maintenance costs; reduce inventory costs of spare materials; reduce crew training time costs; increase the flexibility of scheduling pilots and reduce manpower deployment costs^[5].

Therefore, model commonality research is very important for determining the basic shape of the aircraft. On the basis of considering market demand, safety, quality and cost, the independence of the following aircraft should also be maintained.

5. COMMON DEVELOPMENT IN CIVIL AIRCRAFT DESIGN

5.1 INCREASE THE DEVELOPMENT AND APPLICATION OF DIGITAL DESIGN SIMULATION TECHNOLOGY

In the product development and design, the single use of DELMIA software can not transfer information to all links, so it is necessary to introduce different digital simulation design techniques. From the initial research and development work, the staff of each department cooperate with each other and use the digital work design research theory. Improve the quality of R&D and establish an integrated system software platform. In the product design, the combination of DELMIA software and PDM software can store and recall data to realize the timeliness and accuracy of data. If the DELMIA software is combined with CAPP software, it can have strong text processing functions. Make the system more practical. The developmental elements of commonality in civil aircraft design are shown in Figure 1.

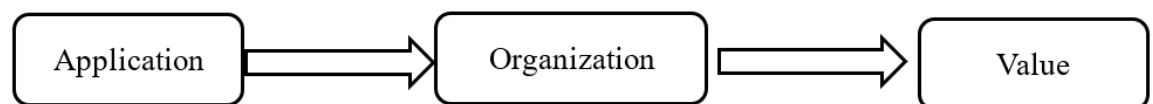


Figure 1: Developmental elements of commonality in civil aircraft design

5.2 ESTABLISH A DIGITAL ORGANIZATION MANAGEMENT SYSTEM

Adopting the latest management methods, building a professional management team, establishing the organization of the digital system as a management platform, using the resources between various departments, taking the structure of the industrial chain as a chain between enterprises, reaching the standard scale of international suppliers. In the product design and development, it is necessary to carry out strict supervision and examination of each work, change the traditional management methods,

communicate well with manufacturers and users, form a management team, timely solve technical problems in the product development process, and strive to shorten Construction period, improve work efficiency, reduce costs, and achieve economic benefits.

5.3 IMPROVE THE VALUE OF THE SYSTEM

Civil aircraft has a wide customer base. Civil aircraft manufacturers need to use system software in the manufacturing process to personalize the file format and signing mode to meet the needs of some customers for the format of process documents. In the actual management, bar code management of material resources, reducing the labor force of managers, can also prevent the wrong operation caused by labor, and at the same time combine the humanized management mode to fully exert the functional characteristics of the system.

6. CONCLUSION

In summary, the competitiveness of the civil aircraft manufacturing industry is mainly controlled by four aspects of time, cost, quality and service. These aspects have become the development goals of the aerospace industry. Digital design and manufacturing technology have improved the aviation industry, improved the quality of civil aircraft, shortened the development cycle, reduced cost investment, and achieved customer satisfaction. For the overall technical reform of the civil aircraft manufacturing industry, leaders need to establish a professional work team to comprehensively enhance the competitive position of enterprises in the industry.

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