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Application and Development of Flight Data Monitoring System in Aviation Safety Management

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Abstract: Safety is the eternal theme of civil aviation. With the progress of society and the development of economy, the development of general aviation is imperative, and people's attention to navigation safety is getting higher and higher. Modern and effective safety management methods and tools need to be adopted to improve general aviation safety production levels. The application of the successful application of flight aviation quality monitoring to general aviation is an effective way to effectively improve the general aviation safety production level.

Keywords: Flight data monitoring system; Aviation security management; Application; Development.

1. Introduction

1.1. The definition and function of the flight data monitoring system

Flight Data Monitoring System (FDMS) is a system that planes collected, recorded, and analyzed data during the flight. The system can provide complete flight operation information for airlines and operators, timely discover possible safety issues that may exist, and improve the level of flight safety.

Flight parameter monitoring is a method that uses airborne sensors and record devices to monitor real -time monitoring of parameters such as heights, speed, posture, engine parameters, and meteorology of the aircraft. At the same time, the collected data is stored in the flight data recorder (FDR), and the wireless communication technology is transferred to the data center of the ground to store and analyze it. The flight data monitoring system provides enterprises with complete flight operation information through integration, analysis, visualization and other means.

This article introduces a flight data monitoring system based on computer vision technology. This plays a great role in investigation of the accident. In emergencies or accidents, the flight data monitoring system can provide drivers with information such as detailed flight status and driver operation to help the accident investigation team restore the accident process and find out the reason. Continuous monitoring of the aircraft, timely discover the potential danger of the aircraft's speeding, stall, and height abnormality in time, and evaluate and improve the aircraft's operating procedures. This project will also train and evaluate the driver through real -time monitoring of flight data, thereby improving the driver's flight technology level and improving the driver's safety awareness. Using these data, we can find out the problems existing in the operation of the aircraft, so as to formulate a series of improved solutions to achieve the goal of improving operational efficiency and saving costs.

On this basis, a new, self -intellectual property rights and independent intellectual property rights monitoring system is proposed. The study is of great significance to improving the level of civil aviation security in my country, and it can also provide strong support for the operation management and pilot training of Chinese civil aviation enterprises. On this basis, a new, scalable, scalable, scalable flight data monitoring system is proposed.

1.2. The component and principle of the monitoring system

Real-time tracking of flight data is realized in practice through the continual monitoring, recording and analysis of the flight data. Sensors are used for real-time acquisition of all kinds of airplane's parameters, which are then transferred to relevant data storage equipment. Data acquisition equipment is in charge of gathering and storing the information, which can be downloaded and handled by Earth Data Center or related administrator. By analyzing the flight data, it is possible to discover the hidden hazard caused by the airplane's acceleration, stall, altitude anomaly, and so on. Furthermore, the system can also give a detailed report on the flight condition and the driver's actions to assist in the recovery of the incident process and to identify the reasons for the crash. By continuously monitoring and analyzing the system, it is possible to supply critical operational information to the air carriers to enhance their security.

The structure and operation theory of Feihang Data Monitoring System decide its usage efficiency and actual value. Study high -efficiency sensors, data collection, storage and analysis methods, establish scientific and reasonable data monitoring and analysis methods, provide strong support for my country's civil aviation safety management, and promote the continuous improvement of my country's civil aviation security guarantee.

2. The application of the flight data monitoring system in aviation safety management

2.1. The role of the flight data monitoring system in the accident investigation

In aviation safety management, the flight data monitoring system plays a very important role, especially for the detection of accidents. During the flight, the detailed information preserved in the flight data monitoring system can provide valuable information for the accident investigator, help people restore the accident process, and find out the reason.

On this basis, a complete flight control system with

independent intellectual property rights and high reliability has been established. These materials are irreplaceable in the accident investigation. Through the analysis of the above information, researchers can better grasp the specific situation before the aircraft crashed, and can restore a series of actions and events at that time.

This system can offer operator's operation parameters like control bar, foot and so on. This study has significant meaning on the evaluation of pilot's performance and flying technique, as well as a valuable guidance for the investigation group.

It can also be used to keep track of the operating state of the pilot, the communication equipment and the navigational equipment. Through actual data, researchers can get a better understanding of the operation situation of airplane, and make sure that it is very important for the crash to happen.

Especially, FDM equipment typically employs high-stability memory to keep the data complete and reliable under severe conditions. That is, in case of an incident, even if the plane is destroyed, it will be able to preserve the data and supply vital data for the investigation of the crash.

2.2. Use of Flight Data Tracking System in Incident Prevention

Flying Data Surveillance System is an efficient method in the field of Civil Aviation Security Management. By continuously monitoring, recording and analysis of all kinds of information during flight, we can find out possible hazards and make appropriate measures to prevent them from happening.

Based on the above analysis, the paper puts forward a kind of computerized measuring and controlling system of the radar based on computer vision. Then, a new approach to detect the velocity, the delay and the altitude of the aircraft is presented. In case of an emergency, it is possible to intervene in time to avoid an accident.

It can also be used to keep track of the operating state of the pilot, the communication equipment and the navigational equipment. The system can give timely alarm and maintenance by means of monitoring and analyzing its operating condition, so as to guarantee the regular running of airplane facilities and decrease the risk of failure.

Moreover, this system can be used to track the operating parameters of the driver, for example, the lever and the foot. Based on the study on the pilot's running, it is possible to assess and enhance the pilot's flying techniques, so as to establish a good flying practice and operational program, so as to minimize the hazard to flying. Meanwhile, the large amount of data gathered by FDS can be used in crash simulation and flight training. By analyzing and simulating the real flying data, the pilot can get more accurate information about the real flying experience, and improve his response capability in complicated circumstances.

2.3. Flight Data Monitoring System in Pilot Training and Assessment

Flying Data Surveillance is a key method of the pilot's training and evaluation. Not only does it offer precious data to the pilot's training, but also makes an objective evaluation of the operator's performance and technical level.

Then, we present a novel approach to the problem of CAD/CAM using computer vision technique. This information is useful for assessing a pilot's flying skill. By analyzing the flight data, the pilot can grasp the operational capability of the pilot during take-off, ascent, descent, descent and landing. Then, the coach can draw up the appropriate training plan according to his own knowledge, and carry out the specific technique training, so that he can improve continuously.

Moreover, this system can be used to track the operating parameters of the driver, for example, the lever and the foot. By analyzing the behavior of the driver, we can assess his performance and his flying habits, and find out and correct his poor flying behavior in time. This paper can also be used in the real flying situation. Help the driver to do the simulated training, improve the handling and precision of the accident, and improve the technical and operational performance of the driver.

The system can also be used to monitor and give back to the pilot's flying state. Based on real-time monitoring and feedback of operator's operation data, the pilot can make timely adjustment to the operation pattern to rectify the mistake, so as to enhance the safe capability. In the meantime, it can provide reliable data for simulation and recovery of the driver and driver. Through the analysis and simulation of the actual flight data, the pilot can obtain more precise information about the actual flight experience, and improve the ability to react in complex situations.

3. The development trend of the flight data monitoring system

3.1. Technical improvement and innovation

With the rapid development of my country's civil aviation industry, it has an increasingly important position in my country's civil aviation industry. On this basis, a new, self - intellectual property rights and independent intellectual property rights monitoring system is proposed.

Improve the intelligence of flight parameters monitoring. With the rapid development of artificial intelligence, big data and other technologies, the aviation data monitoring system will have more powerful data analysis and processing capabilities. It can automatically identify abnormal data, risk factors and potential security risks in the data to achieve real -time real -time the purpose of monitoring and warning. The research results of this project can provide a set of intelligent monitoring platforms with independent intellectual property rights in the field of civil aviation in my country, and provide strong support for the development of my country's civil aviation industry.

Future flight data monitoring systems will be more diverse. The aim of the project is to utilize airborne sensor, weather, flow, and ground radar to realize the integrated control of aircraft by using real time communication and satellite positioning. On the basis of comprehensive analysis of all kinds of data, it is possible to determine the risk factors correctly, and improve the accuracy and timeliness of flight safety.

The system has the characteristics of adaptability and flexibility. A more flexible and scalable architecture may be adopted in future flight data monitoring systems, depending on different models, flight environments, and airlines. Furthermore, the project will provide a wide variety of data interfaces and specifications, which will make it easier to communicate with other systems.

More emphasis will be placed on secrecy and secrecy in the future flight data monitoring system. Along with more and more requirements for data safety and privacy, the safety and security of flight data will be more and more important in the

future.

3.2. Progress of data processing and analysis methods

The technology collection technology will also be more complete and more fine. In the future development process, with the development of sensor technology, the acquisition of flight data will become more and more fine. In addition to conventional flight parameter data, it also includes data such as operations, environment, weather and flights of various systems. At the same time, this project will further improve the intelligence and adaptability of data acquisition, so that it can flexibly configuration and adjustment with the flight environment and task requirements to ensure the completeness and accuracy of data collection.

The efficiency of data processing will also increase, and the degree of intelligence will also increase. The future flight data monitoring system will use advanced big data processing and analysis methods to quickly process and analyze massive data. This project intends to introduce artificial intelligence methods such as machine learning and deep learning into big data, identify the abnormal mode, predict potential risks, and put forward related early warning and suggestions. Through the research of this project, a set of effective, intelligent monitoring methods have been proposed to achieve real -time testing and decision -making of emergencies.

The method of data analysis will also be more comprehensive and cross. On this basis, this project intends to conduct big data analysis technologies accumulated in many industries such as financial risk control and medical diagnosis, and conduct more comprehensive and multi -domain big data analysis for aviation transportation characteristics and safety management needs. Through cross -analysis and association analysis, analyze the essential association between data, find deeper safety hazards and risk factors, so as to provide more diverse and comprehensive decision -making support for aviation safety management. The visualization of the system can make it more intuitive and more humane. The future flight data monitoring system will focus on the optimization of the display method of the data, and use advanced data visualization technology to display complex monitoring data to users in an intuitive and easy -to -understand way. Use graphics, maps, animation and other methods to convert information into intuitive information, so that users can quickly master important information and make correct decisions. At the same time, the use of virtual reality, augmented reality and other means, 3D visual display of flight parameters can be used to provide more intuitive help for pilot training and driver driving.

3.3. Future development direction and challenge

On this basis, a multi -source information integration analysis method based on multi -source information is proposed. By integrating analysis of the operating status, meteorological information, and air pipelines such as aircraft, a comprehensive guarantee of flight safety. On this basis, combined with artificial intelligence, big data and other technologies, intelligent analysis and processing of flight data, build a risk evaluation model based on real -time data, and improve emergency response capabilities and accuracy. On this basis, this project will also deeply excavate aviation big data to provide more accurate operating decision support for aviation companies.

In the field of aerospace, how to effectively protect information security in the field of aerospace and effectively protect information security in the field of aerospace is an urgent problem. At the same time, the introduction of new technologies requires a lot of capital investment, which will also exacerbate the complexity of the system. How to take into account the cost and income of technology is an urgent problem. In addition, due to problems such as inconsistency and data formats between airlines and regions, how to achieve standard unified and efficient data sharing of standards has become an urgent problem. The shortage of talents has restricted the development of the flight data monitoring system, and strengthening talent training and promotion has become a top priority. In addition, issues in data privacy protection, rights ownership, and supervision responsibilities need to be further clarified.

4. The limitations and challenges of the flight data monitoring system

4.1. Data privacy protection issue

With the rapid development of my country's civil aviation industry, the rapid development of my country's civil aviation industry has put forward higher requirements for the development of my country's civil aviation industry. In these issues, the privacy protection of personal information is a very important issue.

Because the flight data monitoring system contains many sensitive data such as aircraft status and unit communication records, its privacy leakage will bring major hidden safety hazards. If these data are obtained or used illegally, it will bring great harm to flight safety, and even cause malicious attacks and criminals. In the flight data monitoring system, the acquisition and transmission of data involves various aspects such as airborne sensors, ground stations, and data centers, and there are hidden dangers of data leakage. Especially in terms of data transfer, if effective security protection measures are not taken, it is likely to be attacked by hackers, resulting in data leakage and security risks. In flight data monitoring, due to the sharing of data, higher requirements have been put on the confidentiality of the data. In order to better carry out security management and decision -making support, airlines, civil aviation authorities, third -party service providers and other parties have urgently needed to share data. In the process, how to effectively ensure that users' privacy information is urgent need solved problem. [10]

On this basis, a flight data monitoring system based on privacy protection is proposed. Technically, the encryption and confidential transmission of data should be strengthened to ensure that the data is effectively protected in various aspects such as collection, transmission, and storage. In order to effectively prevent the illegal access and abuse of data, a complete set of management mechanisms must be formulated in a complete set of data utilization and access permissions. On this basis, build a comprehensive law, use and shared laws, regulations and policy systems to collect, use and share, regulate the collection, use and sharing of flight data, clarify the responsibilities and obligations of each relevant party, and carry out the privacy of the data. Systemic protection. This project intends to study the multi -disciplinary cross -flight data monitoring and analysis method based on the two levels of theoretical and practical. The level of civil aviation safety management in my country.

4.2. Technical and cost challenges

In recent years, with the continuous improvement of my country's civil aviation safety management level, my country's civil aviation safety situation has become increasingly severe.

To solve this problem, this project intends to use modern technological methods such as artificial intelligence and big data analysis to intelligently process and analyze it. This requires that the system has a high technical complexity and invested a lot of funds in development and maintenance. In recent years, with the continuous upgrading of aircraft equipment, sensors, etc., the flight data monitoring system has faced the rapid development of technological updates and iterations, and it is urgent to need more technical support and guarantee. Due to the functions of the collection, transmission, storage, analysis of flight data, higher requirements have been put on data collection, transmission, storage and other aspects. Therefore, in the fields of hardware equipment, software development, and network construction, higher technical costs will be incurred. At the same time, with the increase of technological investment, the operation and maintenance costs of the system also increased. If it is necessary to upgrade and maintain regularly to ensure the stability and reliability of the system. In addition, there are many uncertain factors in the flight data monitoring system, such as technical use and cost investment. For example, in the process of introduction of new technologies, there are problems that are not uniform in technical standards and the applicability of technical applications is yet to be tested. This requires system developers and operators to make decisions when weighing technical costs and actual income. At the same time, due to the complexity of aviation services, it faces greater difficulties in practical applications.

In order to cope with the above challenges, its technical architecture and cost control mechanism must be continuously optimized. On this basis, this article proposes a intelligent control method based on the network topology structure. At the same time, it is necessary to formulate corresponding technical standards to promote the close combination of technology and market demand, and to achieve accurate and efficient scientific and technological investment. In terms of cost control, cost management tools and models can be adopted, the cost structure and expenses of the system are comprehensively evaluated and analyzed the system, and a reasonable cost control scheme is proposed to ensure the long -term and stable operation of the system. This project proposes a multi -dimensional information fusion method based on the fusion of polygonal heterogeneous information, facing the fusion of multi -source multi -source information [11].

4.3. Impact of laws and regulations and international standards

With the continuous changes in my country's civil aviation security situation, the severe situation of the security situation of my country's civil aviation is becoming increasingly severe. The formulation and implementation of relevant laws, regulations, and standards will directly affect the design, operation and data processing of the flight data monitoring system, and also bring great challenges to the flight data monitoring system.

At present, countries have different demand for flying data monitoring laws and regulations, mainly focusing on data privacy protection, data storage and sharing, accountability, and data security. Therefore, how to make flexible adjustments in accordance with the laws and regulations of various places not only increases the cost of technology research and development and operation, but also increases the difficulty of system design and operation. On this basis, a new, scalable, scalability, scalability, extensive, prospective and broad application prospects with broad application prospects with independent intellectual property rights are proposed. The main contents are: collection, transmission, storage and analysis of flight data, data formats and interfaces, data sharing and cooperation. The requirements that meet the requirements of international norms are prerequisites that are generally accepted and used in the world, but it also brings greater pressure and cost to system developers and airlines. The data flow of the cross -border also affects the development of the flight data monitoring system[12]. With the continuous acceleration of the global integration process, the transmission and sharing of flight information between countries or regions is increasingly frequent, and the standards of data protection and privacy protection in various countries and regions are different.Cross-border data flow is therefore also hampered by a number of legal and technical issues.

In order to guarantee the system running normally, we should make a complete safety compliance system and data management system according to the related laws, regulations and international standards. Based on the above, we will enhance communication and cooperation with related international organizations, actively participate in the establishment and revision of international standards, and push forward the internationalization of our flight data monitoring system. Meanwhile, the technology of data encryption and identity authentication can guarantee the security and privacy of the data, and solve the problem of cross-border data flow. The relevant laws, regulations and international standards have a direct influence on the development of FDS. So we need to perfect its operation mechanism, so as to adapt to the changing requirements of the law and the international standard, and to provide a reference for our country's civil aviation safety management. Provide stronger and more reliable support.

5. Discussion

With the progress of society and the development of the economy, the development of general aviation is imperative, and the public's attention to aviation safety is increasing. To enhance the safety production level of general aviation, modern and effective safety management methods and tools need to be adopted. The successful application of flight aviation quality monitoring to general aviation is an effective way to improve the safety production level of general aviation.

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