American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 04 ISSUE 09 Pages: 21-25
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY

Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ajast

Research Article

DEVELOPMENT OF MODELS AND ALGORITHMS FOR DECISION-MAKING IN AIRCRAFT MAINTENANCE AND REPAIR TASKS BASED ON THE USE OF INFORMATION TECHNOLOGIES

Submission Date: Sep 14, 2024, **Accepted Date:** Sep 19, 2024,
Published Date: Sep 24, 2024
Crossref doi: https://doi.org/10.37547/ajast/Volume04Issue09-04

Shukhrat Mamirov Bazarkulovich
Tashkent State Transport University, Faculty of Aviation Transport Engineering, 2nd year basic doctoral student (PhD) of the "Aviation Engineering" department, Uzbekistan

Sagdiev Tulkin Axmedjonovich
Tashkent State Transport University, Supervisor: Candidate of Technical Sciences, Associate Professor, Uzbekistan

ABSTRACT

This article provides detailed information on aircraft maintenance and repair using information technology. In addition, special attention is paid to the development of models and algorithms for solving these problems.

KEYWORDS

Technology, aircraft, aircraft engine, maintenance, repair, model, algorithm, aircraft, workshop, management.

INTRODUCTION

Currently, most aviation manufacturing enterprises use a domestic method of organizing the maintenance and repair of aircraft and aircraft engines. This is a waste of time at meetings, conferences, reviews and discussions when making any decisions on the tasks of maintenance and repair of aircraft. Naturally, this is a waste of 20% to 40% of useful time, as a result of which the duration of the maintenance or repair cycle increases and leads to a constant increase in the cost of the MRO service. Domestic and international

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 04 ISSUE 09 Pages: 21-25
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

practice of many aviation enterprises shows that there is an intensive struggle to reduce MRO costs to improve the efficiency of aircraft operation. The main goal of the dissertation research is the activity of the applicant aimed at developing and improving their abilities, increasing the efficiency of using aircraft and ensuring flight safety, significantly related to the state of the functional systems of aircraft, increasing the requirements for safety and regularity of flights, increasing the costs of their maintenance and repair, which requires searching for and implementing new effective methods of technological processes for the maintenance of aircraft equipment. In this regard, the topic of the dissertation is relevant for the operation of civil aviation and has practical significance for increasing the competitiveness of domestic enterprises.

METHODOLOGY

The complex of maintenance activities defined by the aircraft maintenance and repair system is conventionally divided into two groups:

1) scheduled preventive maintenance work related to the prevention of failures and malfunctions;

2) additional work aimed at restoring the operational condition of the aircraft in the event of a failure or malfunction.

The main requirement for the maintenance process as a whole is to ensure the readiness of the aircraft to perform its main functions with the least cost.

The use of modern information technologies allows achieving increased efficiency of maintenance and repair at enterprises. Having this information, the enterprise management has the opportunity to purposefully work to increase productivity, reduce production losses and strictly control the efficiency of using financial resources invested in improving production efficiency.

Today, more and more companies are joining the fight to improve their operational efficiency, and they have enormous growth potential in this area.

Each airline has production workshops and departments or divisions servicing aircraft and its components of Western or Eastern production.

The Republic of Uzbekistan has unique potential for the use and repair of modern aviation equipment of Central Asia. The aviation industry plays an important role in integrating Uzbekistan, which is located far from sea routes, into the global community, so the reforms being carried out in the industry are very important. The laws of most states allow air transport operations only if all aviation products comply with the requirements of the International Civil Aviation Organization (ICAO).

For example, Uzbekistan Airways Techinics LLC is a structural division of Uzbekistan Airways JSC and has 100 years of experience in the field of maintenance and repair (MRO) of aircraft, engines and components. The modern complex of UAT LLC performs MRO of aircraft and their components, such as Boeing 737/747/757/767/787, Airbus 300/310/318/319/320/321.

With the acquisition of Western-made equipment by Uzbekistan Airways JSC, there was a need to master their maintenance, and in 1997, a center for the maintenance of Western-made aircraft was created on the basis of the plant. Already in 1998, the first C-check was performed in Central Asia on one of the Airbus 310 aircraft. Since 1999, C-check maintenance has been performed on Boeing 767 and BAe146/AVRO146-RJ aircraft, and since 2000 - on Boeing 757 aircraft.

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 04 ISSUE 09 Pages: 21-25
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

The functions of the maintenance center (MC) of Western-made aircraft (WMA) are to perform maintenance of WMA, maintenance and repair of WMA components in the scope of the approved scope of activity. Ensure prompt and high-quality elimination of defects identified during the performance of WMA maintenance and repair of KZP. Maintain the quality system in working order as a means of ensuring that the functions performed during the repair and maintenance of aircraft comply with the requirements established by the "Quality Manual".

Development of models and algorithms for decision-making in the tasks of aircraft maintenance and repair based on the use of information technologies is one of the initial stages of aircraft maintenance and repair optimization. A necessary condition for organizing the use of information technologies at an aviation manufacturing enterprise is the creation of a single information space (complex), with the help of which all automated control systems of an aviation enterprise, as well as departments, workshops and divisions can quickly and promptly exchange information. One of the most important conditions for the implementation of an automated control system for organizing work on aircraft maintenance and repair (digital production) using information technologies (model and algorithm for decision-making) is the functionality that will allow automatic collection of data on the work performed by all production facilities (aircraft, ground equipment, tools, workplaces of enterprise employees, supply (provision of spare parts and consumables), auxiliary service departments, departments, laboratories, etc.) into a single information space (comprehensive database), for the purpose of operational management of production during maintenance and repair of aircraft in an aviation enterprise.

An example of such functionality is a smart system for monitoring maintenance and repair work, which allows monitoring the work of production personnel in real time, classifying and analyzing their work, conducting operational dispatching of workshop and service departments, transmitting information to the information space (complex database), issuing reporting information, interacting with production planning and management systems. The main object for the automated management system of an aviation enterprise is an aircraft. This should be the starting point in the implementation of a new production planning and management program. First of all, the corresponding automation of processes should be carried out in this direction.

There are many factors that influence the choice of the optimal strategy option for aircraft maintenance, namely failures or defects that are detected during the defect detection process, is the ability to perform its functional potential in due quality and volume. The purpose of the strategy of this system is to prevent significant time losses for other work and minimize costs, reduce the cost of the serviced aircraft, and ensure reliability and high-quality performance of aircraft maintenance and repair work. To do this, it will be necessary to take into account all service services, departments, workshops and auxiliary services, as well as the entire work process associated with aircraft maintenance.

For integrated management of maintenance, repair work, costs, inventory control and purchases of spare parts, more common software products have been created and developed.

Aviation enterprises need to create low-cost products, which requires increasingly rapid development and implementation of various methods, devices and systems, while the intellectual level of software is of

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 04 ISSUE 09 Pages: 21-25
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

great importance. At the same time, one of the main requirements for software is the ability to quickly and in real time evaluate output data and obtain analytical results. Based on the analysis, we carry out automated data collection on the values of physical parameters at specified points of the object under study, as well as primary data processing, data collection and transmission, and their interaction. It is proposed to develop a model and algorithm for aircraft maintenance and the use of information technology.

CONCLUSION

In conclusion, the benefits, advantages and advantages of using software (product) for planning and managing all processes of work during maintenance or repair of Western-made aircraft. The use of such software in aircraft maintenance can have several useful effects:

Increased efficiency. It helps to quickly determine what types of work will be performed, what tools are required, what equipment needs maintenance or repair, which ensures faster and better performance of these works. This reduces time, downtime and increases productivity.

Process optimization. It helps to optimize the maintenance or repair process, which reduces the cost of these works and increases the efficiency of the process.

Improved safety. It helps to monitor the condition of the equipment and quickly respond to any possible problems. This increases the safety of work on different equipment, at different altitudes and reduces the risk of accidents.

Reduced workload on personnel. Software can make maintenance or repair work more efficient, which reduces the number of personnel required and reduces the cost of their maintenance.

Improved service quality. The software helps to quickly determine what types of work should be performed and on the basis of what documentation and will help to identify and find possible problems with equipment and tools and take measures to eliminate them. This allows to improve the quality of service and increase customer satisfaction.

REFERENCES

1. Куприяновский В.П., Добрынин А.П., Синягов С.А., Намиот Д.Е., Уткин Н.А. Трансформация промышленности в цифровой экономике – экосистема и жизненный цикл // International Journal of Open Information Technologies. 2017.
2. Ингеманссон А.Р. Актуальность внедрения концепции «индустрия 4.0» в современное машиностроительное производство // Наукоёмкие технологии в машиностроении. 2016.
3. Damilare T.O., Olasunkanmi O.A. Development of Equipment Maintenance Strategy for Critical Equipment // The Pacific Journal of Science and Technology. 2010.
4. Романов А.Ю. Совершенствование системы управления ремонтом и обслуживанием технологического оборудования предприятия: диссертация на соискание ученой степени кандидата технических наук // Московский государственный технологический университет. Санкт-Петербург, 2011.
5. Боровков А.И., Клявин О.И., Марусева В.М. и др. Цифровая фабрика (Digital Factory) Института передовых производственных технологий СПбПУ // Трамплин к успеху [корпоративный журнал дивизиона «Двигатели для гражданской авиации» АО «ОДК»]. 2016.

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 04 ISSUE 09 Pages: 21-25
OCLC – 1121105677
Crossref doi Google Scholar WorldCat MENDELEY
Publisher: Oscar Publishing Services

6. Косарева В.П, Королева А.Ю. Экономическая информатика и вычислительная техника: учебное пособие. М.: Финансы и статистика. – 1996.
7. Матвеев А.О. Современные зарубежные и отечественные системы мониторинга работы промышленного оборудования // Промышленные регионы России. Санкт-Петербург, 2015.
8. Кудряшов Р. Б. Планово- предупредительный ремонт и его роль на производстве. // Справочник экономиста. – 2014.
9. Левенцов В.А. Модели и инструментальные средства составления календарных расписаний работы механообрабатывающих цехов: диссертация на соискание ученой степени кандидата экономических наук // Санкт-Петербургский политехнический университет. Санкт-Петербург, 2007.
10. Шнитин Ю.В., Левенцов В.А. Имитационное моделирование календарных графиков производства // Экономика и промышленная политика России. Труды III междунар. науч.-практ. конференции. 2004.
11. Погодаев А.К., Корнеев А.Д., Маракушин М.В. Задача перспективного планирования ремонтно-восстановительных работ // Управление большими системами: сборник трудов. – 2006.
12. Мышенков К.С., Романов А.Ю. Метод решения задачи календарного планирования ремонтов технологического оборудования предприятия с использованием генетического алгоритма // Машиностроение и компьютерные технологии. – 2011.
13. Никитин А.В., Рачковская И.А., Савченко И.В. Управление предприятием (фирмой) с использованием информационных систем: учебное пособие. - М.: ИНФРА-М, – 2007.
14. Martin B. Putting Theory into Practice: A Guide to Effective Maintenance Strategy Implementation // Asset Management Services. ABB Eutech. – 2003. С.
15. Резницкий А.И. Разработка нового метода планирования ремонтов оборудования электростанций с учетом расходуемых ресурсов: диссертация на соискание ученой степени кандидата технических наук // Всесоюзный научно- исследовательский институт электроэнергетики. Москва, – 1984.
16. https://hubex.ru/
17. https://soware.ru/products/amos-maintenance-and-procurement
18. http://www.seaproject.ru/products/seascape
19. https://www.fiixsoftware.com/