

# Design And Development of An Inventory Management System in Aircraft Tools and Equipment's Using Radio Frequency Identification

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**Abstract:** - Airplanes are supposed to undergo routine checks before and after flying for a determined number of hours. If not managed well, maintenance could lead to delays and the associated loss of revenue due to penalties and refunds to customers. With the ongoing improvement of technology and equipment, tool handling is becoming more and more of an issue for Aircraft Maintenance companies. There is a greater requirement for a company to use variety of tools. This in turn causes for some tools to be misplaced or to be unorganized. Usage of modern technology like RFID should be implemented for better efficiency in tool handling. Proper Tool Handling affects safety. Leaving a tool in an aircraft or engine is not just an inconvenience, it is a safety risk. Realizing this, most aircraft maintenance companies enforce some sort of tool control procedures that could be effective in properly identifying/organizing tools. The need for proper handling of tools in this industry is apparent but most mechanic often overlook this which becomes an issue that should be fix. Thus, a proper study and research on how maintenance, repair or overhaul mechanics handle tools should be done and having an inventory of tools prior to starting a task and ensuring that all tools are accounted for at the end of the task or at the end of the work day is the best way to ensure that no foreign objects are left in the aircraft.

**Key Words—** *RFID, MRO, Maintenance Task, Tool Inventory.*

## I. INTRODUCTION

Airplanes are supposed to undergo routine checks before and after flying for a determined number of hours. If not managed well, maintenance could lead to delays and the associated loss of revenue due to penalties and refunds to customers. With the ongoing improvement of technology and equipment, tool handling is becoming more and more of an issue for Aircraft Maintenance companies. There is a greater requirement for a company to use variety of tools. This in turn causes for some tools to be misplaced or to be unorganized. Usage of modern technology like RFID should be implemented for better efficiency in tool handling.

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Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder, a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to tools, equipment and goods.

Proper Tool Handling affects safety in aircraft maintenance companies. Enforcing some sort of tool control procedures like RFID system will be effective in properly identifying/organizing tools. This study and research on the application of RFID on maintenance, repair and overhaul companies will help them to properly track their inventory such as tools, equipment, parts and consumables tools.

Our objective in this study is to know the benefits on proper handling and organizing of Aircraft Maintenance Tools and Equipment through the use of Electromagnetic Field (Radio Frequency Identification).

## II. ELECTROMAGNETIC FIELD USAGE IN AIRCRAFT TOOLS AND EQUIPMENT FOR PROPER HANDLING

This chapter deals with the different literature and studies based on different sources such as books and internet. The following related literature and studies may help the researchers to develop the proposed system.

RFID Attendance Monitoring System (2013), this system is an electronic device which is use in attendance management system by faculty members. It provides robust, secure and automatic attendance administration in faculties.

Radio-Frequency Identification Attendance Monitoring has programmed RFID software specially for optimizing attendance tracking. Thus, combined RFID hardware with this software, it automates the whole system.

The existing conventional attendance system requires students manually sign the attendance sheet every time they attend a class. Having a system that can automatically capture student's attendance by flashing their student card at the RFID reader can really save all the mentioned troubles. This is the main motive of the system and in addition having an online system accessible anywhere and anytime can greatly help the lecturers to keep track of their student's attendance looking at a bigger picture, deploying the system throughout the academic faculty will benefit the academic management as students' attendance to classes is one of the key factors in improving the quality of teaching and monitoring their students' performance. Besides, this system provides valuable online facilities to related academic management staffs especially for the purpose of students' progress monitoring.

Low-tech, manual inventory management procedures don't seem like a daunting challenge when inventory is small and there's only one warehouse location to manage. But as demand increases and inventory expands, inefficient, labor-intensive and low-tech standard operating procedures are difficult to scale. Most maintenance repair overhaul companies in the Philippines requires a lot of time in logging in/out the tools and equipment in their warehouse. This will result in unproductive performance to their employees, consume man power that is dedicated to a specific task and will also cause a delay on the side of the customer. The adaptation of RFID on their tool management system will help them to reduce all the inefficiencies that results from the manual inventory.

Aside from the manual inventory documentation that is very inefficient, the MRO companies need to know their current

inventory to make sure that over stocking of their supply will be on the average. Tracking all the assets in their warehouse will provide information to the company if they need to purchase additional tool or when is the right maintenance schedule of the tool/ equipment.

This study aims to provide assistance to all maintenance, repair and overhaul located in Clark Pampanga with their shortcomings on their inventory management system. Maintenance, Repair and Overhaul companies are aviation related facilities that provides maintenance checks to passenger and cargo aircrafts. Maintenance checks on the aircraft requires a lot manual documentation for the in and out of tools, equipment, parts and consumables which are needed to complete each task of the maintenance. This manual documentation may result in inconsistent tracking, warehouse efficiency and missing materials which can be reduce by upgrading their management system and applying the RFID (radio frequency identification).

## III. RESEARCH MODEL

This study will use Quantitative research design. Quantitative research is defined as a systematic investigation of phenomena by gathering quantifiable data and performing statistical, mathematical, or computational techniques. Quantitative research collects information from existing and potential customers using sampling methods and sending out online surveys, online polls, questionnaires, etc. Quantitative approach has a set of questionnaires online that will determine the answers of the aviation employees.

The focus of this study are employees who are working in a maintenance, repair and overhaul companies in Clark, Pampanga. Our data is gathered through the help of google form surveys which made our work easier. The computed total sample size will be 21 respondents. In selecting the participants of the study, researchers established the following criteria: (1) They are at least residing in the Philippines or specifically, Clark; (2) Must be 21 years old and above; (3) Employed in a MRO company; (4) Assigned specifically in the warehouse and at the planning department.

In our Instrument in gathering the data necessary for this study, the Researchers conducted a survey using Google Forms which targets employees currently working in the Aviation Industry. The questionnaire found via Google Forms consists of tests, checklists, sheets, and scales used to accumulate the abundant

amount of data needed to conduct this study. The questionnaire is a set of orderly arranged questions carefully prepared to answer by a group of people designed to collect facts and information. The first part of the questionnaire is filling up the stated information needed. The second part is the questions to be answered by the respondents. We mostly used Likert Scale Method in the survey questionnaires to specify the level of agreement of the respondents to the statement.

#### IV. RESULTS AND DISCUSSION

The purpose of the study is to give assistance to all maintenance, repair and overhaul company located in Clark Pampanga with their shortcomings on their inventory management system and know if a Radio Frequency Identification device could help with this. We developed a questionnaire which serves as a tool to validate some of the aspects of our model. The purpose of the questionnaire was not only to provide data for this research but also to identify aspects of the subject for future research. The sample consisted of 21 respondents who answered questions related to inventory management system of maintenance, repair and overhaul companies.

The related research questions were (a) Will radio frequency identification (RFID) can make the inventory management in an MRO company efficient, (b) Is it safe to the company to adapt a system like radio frequency identification (RFID) to their inventory management, (c) Will the use of radio frequency identification (RFID) can make the work/task easier in the MRO.

The detail of the breakdown is presented as follows.

- 15 out of 21 respondents thinks that radio frequency identification can make inventory management more efficient in an MRO company while 6 of them think the conventional method is more efficient.
- 14 out of 21 respondents said that it is safe for a company to adopt a system like radio frequency identification to their inventory management while 7 of them are still skeptical in using this technology in their companies.
- 15 out of 21 respondents thinks that radio frequency identification can make work/task easier while 6 of them think the conventional method is more efficient in an MRO company.

Results shows that Proper Tool Identification is the most possible benefit of using RFID in inventory management. This is followed by Accurate Tool Inventory, Automated Logging of Tools and Equipment, Incorporation of Tools Required per Task and Additional Man Hour.

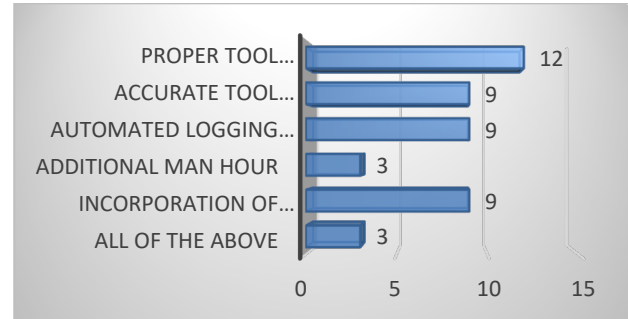


Fig.1. Benefits in Using RFID in an MRO company.

The results of this research shows that personnel of MRO companies are willing to try using RFID to improve their inventory management. They think that it is more efficient than the conventional way of tool keeping/inventory. Lastly, they can see the different benefits in incorporating RFID in managing their tool inventory.

#### V. CONCLUSION

Some of the personnel that took the survey are not knowledgeable/familiar with the use of Radio Frequency Identification (RFID). There are also some that are hesitant to try and apply the new technology on their daily activities since the new technology is not common to the usual inventory management. Benefits like tool identification, accurate tool inventory, automated logging of tools and equipment, additional man power/hour and incorporation of tools per task required majority made the majority from the respondents to willingly and gratefully welcome the new system in their company.

RFID solutions serve organizations/companies of all sizes by automating inventory, operation and boosting asset utilization like the man power needed on other task, allowing them to quickly enhance productivity and cut costs. RFID is currently at the center of the development and can serve as the foundation for an effective asset management system to make sure that each company who adapt this system will greatly benefit and maximize their profit. With the help of this research, we identify the need of Radio Frequency Identification (RFID) in the aviation industry which is the very objective of this study.

The researchers acknowledge the need of Radio Frequency Identification (RFID) in the Maintenance, Repair and Overhaul companies in the Philippine. Based from the gathered data, we recommend that each company who are willing to accept the new technology to introduce and have a proper training on their employees. Contacting and counselling from professional experts on the field of Radio Frequency Identification (RFID) are very much needed before the adaptation of new technology. We also recommend that each company should have a financial advisor that will help them classify if the new technology will greatly benefit their operations.

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