

THE REVIEW ON THE EFFECT OF THE RESOURCES MANAGEMENT ATTRIBUTES AND AIRCRAFT MAINTENANCE EFFICIENCY OF THE AVIATION INDUSTRIES IN OMAN

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ABSTRACT

As the aircraft maintenance is one of the very essential resources to enhance the aircraft productivities those facilities such as spares, human, and financial add to that the organizational factors in which will help to make the maintenance more efficient and safe because the safety is the priority part in maintenance in which the organization should take in consideration. The main purpose of the study is to investigate existing available literature for determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry in Oman. Therefore, the study uses available sources of existing literature explored to covers from Google Scholar, ProQuest, and Scopus, and other online resources. Based on this extensive review, the study determined the resource management attributes and aircraft maintenance efficiency and have moderating role effective planning and internal control in the aviation industry in the sultanate of Oman. The summary review findings of the study will fill the gap in the existing body knowledge especially prime factors affecting the attainment of aircraft maintenance efficiency, resource management attributes, effective planning and 'internal control

and aircraft maintenance in the aviation industry in the sultanate of Oman. The study recommends for policy guideline for ensuring of determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry in Oman.

Keywords: Aircraft Maintenance, Aviation Industry, Resource Management and Aviation Industry in Oman.

INTRODUCTION

Aircraft maintenance is considered as the most critical activities that airlines should take into consideration with a high priority and never underestimated actions (Bowen, 2013). Many obstacles and challenges faced this process in the early days, one of them is the consumed time needed to complete the proper maintenance for the aircraft, the detailed and exhausting checking procedure over each part of the plane in a periodical base, and the highly expensive cost of the maintenance and pausing period of the functionality during this time. During the cycle of the major maintenance inspections, the aircraft will be on hold and this downtime can be tremendously increased due to different factors as aircraft maintenance facilities, management of spare parts, organizational factors, financial implications, and human factors. The extended aircraft downtime during aircraft servicing is undesirable to any aircraft operator as it affects the very basic purpose of an aircraft (Jeff Fitzgerald, 2017).

As the aircraft maintenance facilities is one of the very essential factor to enhance the aircraft productivities those facilities such as spares, human, and financial add to that the organizational factors in which will help to make the maintenance more efficient and safe because the safety is the priority part in maintenance in which the organization should take in consideration (Bowen, 2013). The aviation industry safety is one of the critical aspect of successful performance, moreover the personnel are the key players in all maintenance activities so it is not only carry out the activity but carry it with safely (Bowen, 2013). There are numerous causes for the undesired extended aircraft downtime caused by ineffective maintenance. It has mentioned that up port of a huge armada of airplane postures critical challenges for a commerce in terms of accomplishing the different, and in a few ways clashing, objectives relating to support and operation costs and wanted benefit levels (Samaranayake & Kiridena, 2012). Moreover, to reduce or minimize the extended aircraft downtime by improving the aircraft maintenance efficiency, it is mandatory to know the reasons that are helping the aircraft to remain under Hangar maintenance more than the estimated time of maintenance. The study also mentioned that there are two major stream of literature which focus in studying the problems which facing the heavy maintenance, he found that the first problem was focusing in the scheduling of the fleet of the aircraft, which known as “service scheduling” ((Bird, 1976);(Sherif, 1980);(Elkodwa, 1996);(Chan, Cheung, Ip, Lu, & Lai, 2005)) and the other problems focusing in managing with perspectives of nitty gritty arranging and planning of exercises and support facilities such as materials, resources and maintenance personnel (Dijkstra, Kroon, van Nunen, & Salomon, 1991);(Chan et al., 2005);(Alfares, 1999);(Chan et al., 2005);(Kilpi, Töyli, & Vepsäläinen, 2009)).

It was obvious from the literature review that the downtime or the Aircraft on ground (AOG) is the issue of the aviation industry in Oman, which was caused by some factors such as Aircraft maintenance facilities, organizational factors, and human factors, therefore managing the above causes by proper planning and control will minimize the aircraft downtime. Therefore, it is timely initiatives to investigate existing available literature for determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry

in Oman. Thus, the study aims to investigate and review the effect of organizational factors, aircraft maintenance facilities, human factors, financial allocation, spare parts management, through a mediating variable which is planning and control of Maintenance resource in aviation industry in Oman.

BACKGROUND OF THE STUDY

Historical development of aviation industries in Oman

Oman's civil aviation was started in the year 1929 with a small airstrip made in Muscat. Initially was used for military purposes and occasionally for the flights of PETROLEUM Development Oman (PDO) Company. In 1960's Gulf Air started to operate its DC3 commercial flights to Oman. Oman started its own national carrier in the year 1970 as Oman International Services (OIS). The Sultanate of Oman became a member of the international Civil Aviation Organisation (ICAO) in the year 1973. Oman purchased Gulf Air's light aircraft division in the year 1977 and became Oman Air Services in the year 1981. A new airport was built at Salalah and OAS started operating regular domestic flights from Muscat to Salalah. The real development of Oman's civil aviation started when Oman Aviation Services (OAS) became Oman Air in the year 1993 and started to operate international services to Dubai and India. In the year 1996 Oman Joined the Arab Civil Aviation Organisation (ACAO) and in 1998 Oman Joined International Air Transport Association (IATA). Oman Air engaged CFM to provide engine maintenance services in Muscat. Airports were built in Adam, Butabul, Buraimi, Dibba Al-Baya, Duqm, Fahud, Qarn Al Alam, Haima, Ibra, Ibri, Khasab, Lekhwair, Marmul, Mukhaizna, Nizwa, Ras al Hadd, Rustaq, Saiq, Salalah, Sohar, Sur and Yibal.

At present more than 550,000 aircraft overfly Oman's airspace. Civil aviation aircraft fly to more than 75 destinations from various airports in Oman. Flight developments at Muscat air terminal developed by 6.3% per year between 2013 and 2018 reaching 125,543 movements in 2018. Passenger traffic increased by 12% per year between 2013 and 2018 reaching 18 million passengers in Muscat International airport, Salalah Airport, Sohar Airport in 2018. Cargo traffic grew by 11% per year between 2013 and 2018 reaching 212,674 tons in 2018. The contribution of the direct and indirect civil aviation sector in the GDP of the Sultanate of Oman amounted to about 3.9 billion US dollars in 2018. In 2017 Salam Air, the first ever low cost carrier in Oman started its operations. Oman Aviation group was founded in the year 2018 comprising of Oman Air, Oman Airports and Oman Aviation Services expanding the civil aviation sector in Oman. The civil Aviation industry in Oman employs more than 10,000 workforces from various countries and has potential to grow in future.

Concept of aircraft maintenance efficiency and resource management attributes:

Aircraft maintenance is considered as the most critical activities that airlines should take into consideration with a high priority and never underestimated actions (Bowen, 2013). Aircraft maintenance should be carried out to continue the aircraft in its airworthiness condition. The airworthiness of an aircraft is a continuous process. In this regard, Vitor Monteiro Correia (2011) presented the methodology of Aircraft Maintenance Program (AMP) development in understanding with the necessities of proceeding airworthiness to show the interrelation between the AMP and the other regions of proceeding airworthiness. This work demonstrated the importance of the AMP for the Continuing Airworthiness Management (CAM). The factors which can be controlled to prevent accidents were discovered.

METHODOLOGY OF THE STUDY

As study aims to investigate existing available literature for determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry in Oman. Therefore, the study uses available sources of existing literature based on the four main keywords 'aircraft maintenance efficiency', 'aircraft maintenance and resource management attributes 'or 'effective planning and aircraft maintenance, and 'internal control and aircraft maintenance, etc, and explored to covers from Google Scholar, ProQuest, and Scopus, and other online resources.

EMPIRICAL REVIEW FINDINGS OF THE STUDY

The literature review is carried out by searching and retrieving scholarly articles from scientific journals, research reports, books, and conference proceedings; it is mainly based on finding the major factors related to the aircraft maintenance process. By getting this information, choosing the proper factors to be deployed in the Oman aviation sector will be easier and more efficient. Several studies were conducted in the past by scholars in the field of flying machine upkeep administration and flying machine upkeep resources management. These papers were covering aircraft maintenance facilities, spare parts, profitability, human factors, planning and control, manpower, and training and organizational factors. These factors were discussed elaborately and covered the impact of these factors on aircraft maintenance. This study will try also to analyze and discuss the main problem that will occur in case the maintenance of the aircraft won't be done on the time sat during the planning stage of the maintenance activities.

Aircraft Maintenance Efficiency

Aircraft maintenance should be carried out to continue the aircraft in its airworthiness condition. The airworthiness of an aircraft is a continuous process. In this regard, Vitor Monteiro Correia (2011) presented the methodology of Aircraft Maintenance Program (AMP) development in understanding with the necessities of proceeding airworthiness to show the interrelation between the AMP and the other regions of proceeding airworthiness. This work demonstrated the importance of the AMP for the Continuing Airworthiness Management (CAM). The factors which can be controlled to prevent accidents were discovered.

Siddiqui et al. (2012) stated that Aeronautics upkeep is an unpredictable and requesting attempt. Its prosperity, which is at last estimated by the wellbeing of the flying staff, relies upon correspondence also, cooperation. Over the previous decade, the significance of cooperation in the upkeep setting has been broadly perceived. The outcome has been the rise of human variables preparing, Maintenance Resource Management (MRM) projects, and other group focused exercises inside the avionics upkeep network. The subtleties of MRM projects shift from association to association. All MRM projects interface and coordinate conventional human factors points, for example, gear structure, human physiology, the outstanding task at hand, and working environment wellbeing. Moreover, the objective of any MRM program is to always improve work execution and security. MRM projects do this by decreasing upkeep blunders through improved coordination, correspondence, and expanded mindfulness. Denizhan and Dogru (2017) mentioned that in recent years the maintenance facilities gain popularity in the maintenance organization, also facilities management has shown evaluable improvement in different aspects of the maintenance organization, especially in supporting the core business of the organization.

Aircraft resource management attributes

The present study is covering of aircraft maintenance facilities, spare parts, profitability, human factors, planning and control, manpower, and training and organizational factors. These factors were discussed elaborately and covered the impact of these factors on aircraft maintenance.

Management of Spares

For getting the aircraft ready to fly it's essential to be serviced according to the maintenance manual, moreover some maintenance requires some components to be replaced, which means the spare parts must be available. According to (Samaranayake & Kiridena, 2012), aircraft maintenance is a very high activity in which does not except a spare part shortage. Other researchers concluded that if there is a shortage of spares or limited with spares in the inventory, removing some parts from a similar device which is in phase-out process or grounded for a long time for maintenance and use it to service the aircraft required for an operation will be the proper solution (Block, Ahmadi, Tyrberg, & Söderholm, 2014). The parts removed from that retired aircraft can be in three conditions as follows: Usable (serviceable, sent specifically into storage), Repairable (unserviceable, but can be reused after a repair activity, sent to the Repair shop), Unfit for a benefit (not one or the other reusable nor worth repairing and ought to be scrapped), As a framework for maintenance spare parts planning and control, (Driessen et al., (2015) served as a valuable beginning point in making specie plans of maintenance save portion arranging and control frameworks. Within the leftover portion of this segment, we outline each cluster of choices from the execution pointers MLO's confront

Organizational Factor

As it well known there are so many factors we call classified them as organizational factors because the organization has control over them those factors are as listed below:

- Technical factors: specified as the specialized variables employments markers to watch the execution of a specific framework, Handle, maintenance, and components (Chong et al., 2019).
- Financial factors: Monetary components are made up of two primary components which are the accessible budget and the required taken a toll. To execute upkeep arrangement, office supervisors got to take into consideration both the budget and taken a toll. Budget allotment incorporates a noteworthy effect on the overall upkeep arranging. In the circumstance where an upkeep unit endures budgetary cuts, changes must be made in the support needs. Whereas prioritization does not completely solve the financial issue, it can offer a brief arrangement in redirecting assets into tall priorities maintenance works. Non-critical support works that don't have the desired funding are more often than not conceded whereas basic upkeep works are executed to begin with (Jeff Fitzgerald, 2017). According to (Rustenburg, van Houtum, & Zijm, 2001) the final decades, as a result of a changing political scene as well as changes within the public opinion, numerous military organizations have been confronted with genuinely declining budgets. Tight budget limitations may lead either to transfer of tasks, or to endeavors to extend the general efficiency and quality of the work, to progress the responsiveness to the regularly inner clients, whereas at the same time a leaner organization is sought after (do more with less). Numerous ventures have been begun to implement state-of-the-art Data Innovation (IT) apparatuses, to streamline the organization (less hierarchical levels, presentation of autonomous workgroups) and to rebuild both production and materials administration.

- **Social factors:** Social calculation has different implications depending on its utilization. Within the field of maintenance management, social components such as security and wellbeing, security, building status, and usage were utilized in choosing support needs for buildings. It can be implied that social components for upkeep administration are related to the prosperity of its users/occupants. The best need to support administration ought to be security and health. As security and wellbeing are related to the well-being of the inhabitants or clients, it should be the best thought among all others in upkeep arrange (Martin Hinsch. 2019).
- **Political factors:** The political components are ordinarily related to the partners. Partners are individuals with intrigued in an organization and they are based on a chain of command of proprietors, top management, center administration, lower administration, and end-users. These partners will in the long run decide the upkeep heading of the organization. The bearings can be comprised of the support objectives and targets; maintenance policy; support handle; staff preparing and frameworks. As such, their needs and requests must be satisfied. (Martin Hinsch. 2019)

Organizational Characteristics

Characteristic of an association has a major influence on the wants on offices and support services of each association. Even within the same trade segment, each organization is likely to have distinctive needs in offices and FM functions. The characteristics or natures of the organization reflect its commerce objectives, operation handle, and organizational culture. They impact the organization's needs and management strategy of its offices (Chotipanich, 2004). Gefen et al. (2011) addressed without a clear understanding of the wants of the organization, office supervisors would depend on their self-judgment in overseeing support works, which means that the organization managers should be well known about the facilities which essential to get the maintenance activates done efficiently.

Financial Allocation

Aircraft maintenance involves finance and it is not only important to reduce the manpower wastage but also to reduce the financial wastage. Money has to be saved in all possible ways without hampering the aircraft maintenance safety. Alfares (1999) conducted a case study that about decided the ideal support workforce plan to fulfill developing work prerequisites with the least cost. The discoveries of this work were as follows: The current over the top extra minutes to cover ends of the week and spontaneous maintenance, the seven-day support prerequisite is related to the flight plan, which is dynamic amid the weekends, the noteworthy increment in planned upkeep workload due to changes in both the upkeep program and the flight schedule. Based on the above findings, the paper suggested to fulfill support labor requests for each day of the week, particularly expanding end-of-the-week requests, a seven-day weeks' worth of work plan is proposed for both morning and evening shifts. Exchanging to this plan would kill the requirement for end of the week extra minutes, yielding an evaluated sparing of \$98,000 per year.

Human Factors

Human factors are the term human variables have developed progressively prevalent as the commercial flying industry realize that human blunder, rather than mechanical disappointment, underlies most flying accidents and episodes. Human components science or advances are

multidisciplinary areas consolidating commitments from psychology, designing, mechanical plan, statistics, operations inquire about, and anthropometry. It may be a term that covers the science of understanding the properties of human capability, the application of this understanding to the design, development, and arrangement of frameworks and administrations, and the craftsmanship of guaranteeing the effective application of human factor principles into the support working environment. (Shanmugam & Paul Robert, 2015)

It is important to note that human factors play an important role in all industries and aviation is not an exemption. Human errors may incur heavy losses in lives and machines. Shanmugam & Paul Robert (2015) published a literature review on human factors in aircraft maintenance engineering. The study concluded that discipline in aircraft maintenance has made an extraordinary effect on airplane plan, operations, support, and standards. All previous are connected to shape the security behavior and culture in flying upkeep working environment. In any case, the survey unfurls the monstrous potential for future investigation. Domitrović, & Bazijanac (2017) discussed the same idea. This paper presented the influence of human factors in one of the European aircraft maintenance organizations for wide-body aircraft meant for commercial service. Their findings pointed out the occurrence of errors committed by employees' personality errors in communication, and errors in equipment, tools, and the factor of working Environment. Based on their research paper the recommend creating a working climate within the aircraft maintenance organization that will be stimulated for work and at the same time act preventively on the reduction of human error. Recommendation for continuous monitoring and analysis of human errors that occur in aircraft maintenance units were proposed by the study (Martin Hinsch, 2019).

Moderating Role of Planning and Control

Within the constraints imposed by its design, an operation has to be run on an ongoing basis. 'Planning and control' is concerned with managing the ongoing activities of the operation to satisfy customer demand. All operations require plans and require controlling, although the degree of formality and detail may vary (Ayeni et al, 2016). Alfares (1999) provided a detailed study on how to determine the optimum maintenance workforce schedule to satisfy growing labor requirements with minimum cost. The study concluded that the existing 5 day week work schedule is 13% costlier than the recommended 7-day workweek for the aircraft maintenance workforce, and as a result of his study he recommended switching from a five-day to a seven-day workweek for aircraft maintenance workers.

Kinnison & Siddiqui (2012) discussed how to distinguish and screen upkeep issues and patterns, minimize airship downtime by legitimate arranging, and minimize support costs. Also, Sherwin (2000) points out that in all engineering there is a demand and to meet that demand a planning function should be flexible and also have the ability to adjust to the sequence in which it carries out the work. Also, the engineering work is complex and expensive so its need to be controlled to meet the objectives were set during the plane stage.

Furthermore the importance of leadership in aviation maintenance was discussed by (Kouzes & Posner 2006), where the conducted study that "Leadership is everyone business no matter what your position is, you have to take the responsibility for the quality of leadership your constituents" which mean everyone is accountable for the leadership style the demonstrate. Aircraft support equipment is one of the major parts of the aircraft maintenance facilities which helps technicians to carry their maintenance activities safely and with the time stated, this is supported by (Siddiqui et al., 2012) Aviation Maintenance Management. Second edition where the

paper highlighted the importance of the support equipment to aircraft maintenance. The study stated that the support functions can be stated briefly as an ordering, controlling, and handling of parts and supplies. Last but not least, Samaranayake & Kiridena (2012) clarified the importance of unplanned preservation activities, as commonly arise out concerning inspections carried overseas as the part of condition-based maintenance. These procedures have significant implications for spare parts inventory management, assets management, and knowledge of maintenance tasks. For example, if there is a 50 per cent risk of an unplanned maintenance activity becoming crucial during an aircraft lay-up, even ought to also lie an equal or greater danger over extra demands life positioned concerning substances yet resources, depending on the degree on additional parts stock yet resources utilization.

Review Summary of the Study

As it was the aim to investigate existing available literature for determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry in Oman. The study revealed from analyzing of the review findings that there are different gaps in existing literature and the current research come up with some of the points that should be tackled in the next step of the research. Many studies done by the previous researchers provided several theories that contributed extensively to maintenance resource management. (Miles, 2012) mentioned that since the late 1700s, scholars have talked about the issue of corporate proprietors contracting others as stewards of their riches. Directors of other people's cash cannot be anticipated to observe over it with the same enthusiasm as the proprietor, so administrative carelessness will continuously be shown within the issues of a company. There are different theories related to this issue and try to explain the relation in detail. Agency theory is one of these theories which tries to study of the relationship between a client or "principle" and someone who performs a task on his/her behalf or "agent". This theory tries to show that the principle will act in his/her best interest even if his/her interests conflict with those of his/her agent ((Eisenhardt, 1989). On the other hand, the stakeholder theory justifies that the main priority of an organization should be its social performance and not only its financial performance. It stresses that increasing the wealth of shareholders is not an organization's primary function. On the contrary, stakeholders have an ethical responsibility to participate in the corporate decisions of an organization, and an organization must include them in discussions about the directions it is considering moving in (El Abboubi & Nicolopoulou, 2012).

Explaining how the organizations maintain dominant positions in competitive environments was done by resource-based theory. This theory verifies that the resources in an organization have influences on its performance in addition to organizations compete against one another for resources (Priem & Butler, 2001; Hoopes, Madsen, & Walker, 2003; Peteraf & Barney, 2003 ; Miles, 2012). It also assumes the basis of an organization's decisions about which resources to select and accumulate is composed of the following: economic rationality, limited information, biases and prejudices, and casual ambiguity (Anderson & Richard). Other researchers focused on the important role of the human factors in aircraft maintenance. Shanmugam & Paul Robert (2015) published a literature review on human factors in aircraft maintenance engineering. Study concluded that discipline in aircraft maintenance has made an extraordinary effect on airplane plan, operations, support, and standards. All previous are connected to shape the security behavior and culture in flying upkeep working environment. In any case, the survey unfurls monstrous potential for future investigate.

Virovac, Domitrović, & Bazijanac (2017) explained that some papers presented the influence of human factor in one of the European aircraft maintenance organizations for wide-body aircraft meant for commercial service. Tooley (2013) spoke about the training and qualifications the engineers should have in order for them to work as aircraft maintenance staff. To perform a maintenance to the required standards, individual need to demonstrate maturity, commitment, integrity, and ability to see the job through, often under difficult circumstances. Once the maintenance tasks have been completed to the required standards, category B licensed engineer's certain approvals are permitted to sign-off activities and sign the certificate of release to service (CRS). According to (Berto et al., 2011) human are the planning as an dynamic portion of the flight operations including pilots, support labor, discuss activity controllers, and others. Clearly, it's vital to be able to transfer on exceptionally talented individuals to maintain a strategic distance from mistakes that cause mishances or catastrophes in flight operations. It is at that point vital significance to put these individuals in authoritative and organized setting to ensure a reasonable level of proficient training. By comparing the previous mentioned theories related to maintenance resource management, resource-based theory can be considered as the best choice among them to be the base of the conducted research. The reason for choosing this theory is the resources of an organization possess influence on its performance. In more detail, RBT accepts that organizational choices to choose and collect assets are financially levelheaded and subject to constrained data, predispositions and biases, and causal ambiguity (Teece, Pisano, & Shuen, 1997). Causal ambiguity means that it isn't known precisely how an asset leads to above-average execution for an Organization. A resource is characterized as anything that can be thought of as a quality for an organization. Assets incorporate any unmistakable or intangible resources that are semi for all time tied to the organization. Resource-based theory posits that an organization can achieve sustainable competitive advantage by controlling resources that are valuable, rare, imperfectly imitable, and non-substitutable.

CONCLUSION AND RECOMMENDATIONS

As the study aims to investigate and review the effect of organizational factors, aircraft maintenance facilities, human factors, financial allocation, spear parts management, through a moderating variable which is planning and control of Maintenance resource in aviation industry in Oman. It has been carried out by searching and retrieving scholarly articles from scientific journals, research reports, books, and conference proceedings; it is mainly based on finding the major factors related to the aircraft maintenance process. The studies were conducted in the past by scholars in the field of flying machine upkeep administration and flying machine upkeep resources management. Studies were covering aircraft maintenance facilities, spare parts, profitability, human factors, planning and control, manpower, and training and organizational factors. After analyzing and studying all the different gaps that might be faced in the previous conducted studies, the current research come up with some of the points that should be tackled in the next step of the research. The summary review findings of the study will fill the gap in the existing body knowledge especially prime factors affecting the attainment of aircraft maintenance efficiency, resource management attributes, effective planning and 'internal control and aircraft maintenance in the aviation industry in the sultanate of Oman. The study recommends for policy guideline for ensuring of determining of relevant factors that have cause and effects on the ensuring of aircraft maintenance efficiency in the aviation industry in Oman.

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