



Contents lists available at ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

A qualitative study of outsourced aeronautical maintenance: The case of Brazilian organizations



Marcio Cardoso Machado ^{a, b, *}, Michelle Aparecida Gomes Eller Araújo ^c,
Ligia Maria Soto Urbina ^c, Flavio Romero Macau ^a

^a Universidade Paulista, Unip, Rua Dr. Bacelar, 1212, Vila Clementino, São Paulo /SP, CEP 04026-002, Brazil

^b Pontifícia Universidade Católica de São Paulo, PUC-SP, Rua Monte Alegre, 984, Perdizes, São Paulo, SP, Brazil

^c Instituto Tecnológico de Aeronáutica, ITA, Praça Marechal Eduardo Gomes, 50, Vila das Acácias, São José dos Campos/SP, CEP 12228-900, Brazil

ARTICLE INFO

Article history:

Received 25 January 2016

Received in revised form

28 April 2016

Accepted 28 April 2016

Keywords:

Outsourcing

Aeronautical maintenance

Repair station

Brazil

ABSTRACT

The outsourcing of aeronautical maintenance has been criticized for the quality of services offered. According to the literature, airlines have contracted repair stations to perform maintenance activities on their aircraft or parts when attempting to optimize resources (time, facilities, personnel, money). The attempt to reduce costs in maintenance activities and regulatory deficiencies can lead to maintenance management practices that could threaten equipment airworthiness. Therefore, the aim of this research was to evaluate whether outsourced aeronautical maintenance is aligned to common industrial maintenance management practices. To achieve this goal, qualitative exploratory research was conducted on Brazilian repair stations. For data collection, a questionnaire was developed based on seven factors related to aircraft maintenance. The data revealed that a mismatch exists between the best maintenance management practices and expected repair station performance.

© 2016 Published by Elsevier Ltd.

1. Introduction

Maintenance activities are the backbone of successful aircraft operations (Bazargan, 2015). In the aviation industry, maintenance is highly regulated by various global and local airworthiness authorities (i.e., the European Aviation Safety Agency (EASA), Europe; the Federal Aviation Administration (FAA), the United States; Agência Nacional de Aviação Civil (ANAC), Brasil; and others) (Regattieri et al., 2015). Under such a regulatory context, the main role of the maintenance, repair, and overhaul (MRO) organization for an airline is to provide a fully serviceable aircraft when required by the operators at minimum cost and optimum quality (Al-Kaabi et al., 2007). While planning maintenance activities, an airline can choose to perform these activities “in house,” or outsource them. However, planning and coordinating aircraft MRO tasks is complicated because each aircraft has thousands of serviceable parts (Czepiel, 2003), which are arranged in complex and close

connections that could eventually lead to system accidents (Arminen et al., 2010). In view of the stringent requirements set by regulatory ambiance and of the limited set of internal resources, such as available labor force, infrastructure hangar, and business scope, etc., an airline may choose to partially outsourced maintenance activities to a MRO organization or specialized repair station to execute activities that require more infrastructure or specialization (Al-Kaabi et al., 2007). Outsourcing MRO enables airlines to avoid significant capital investment in facilities, equipment, and inventories of parts and components (Tang and Elias, 2012). Repair service of an aircraft item (a spare part) is usually provided either by the original equipment manufacturer (OEM) that manufactures the equipment (Selçuk, 2013) or outsourced to a certified maintenance service supplier for that specific item. The tasks to be outsourced vary from company to company and aim to keep the aircraft available to fly for the longest period possible at an acceptable cost, given the security matters and in accordance with the regulatory standards of the country.

However, according to Pettersen and Aase (2008), airline companies have outsourced their operational maintenance functions, purchasing them from the lowest bidder. Thus, it is likely that safety issues have occurred due to this outsourcing. Quinlan et al. (p. 285, 2013) found the following three sets of contributory factors

* Corresponding author. Universidade Paulista, Unip, Rua Dr. Bacelar, 1212, Vila Clementino, São Paulo /SP, CEP 12228-900, Brazil.

E-mail addresses: marcio.cardoso@unip.br, mcmachado@pucsp.br (M.C. Machado), michelle@ita.br (M.A. Gomes Eller Araújo), ligia@ita.br (L.M. Soto Urbina), professor@flaviomacau.com (F.R. Macau).

adversely affecting safety outcomes: “First, economic and financial pressures on contractors often led to corner-cutting or unsafe practices concerning to safety. Second, subcontracting was linked to hazardous forms of disorganization including weakened induction, training, and supervisory regimes. Third, regulatory failure including insufficient regulatory coverage, implementation, and enforcement contributed significantly to poorer safety outcomes.” It should be noted that [Quinlan et al. \(2013\)](#) identified that those problems have affected a wide set of countries, which have different regulatory regimes. To address aviation maintenance safety factors, the International Civil Aviation Organization (ICAO) developed Annex 19 to the Convention on International Civil Aviation, dedicated expressly to safety management ([ICAO, 2013a](#)). In fact, it is expected that improving regulation, auditing and enforcement may deter unsafe aviation maintenance practices.

However, a group of factors exists relating outsourcing to hazardous forms of disorganization that could be associated with the lack of good management practices for promoting aviation maintenance safety. [Czepiel \(2003\)](#) analyzed a limited collection of information obtained from interviews with both U. S. airlines and repair stations, mainly regarding their respective quality assurance departments. This study notes that, for the case of some outsourced repair stations, their standards about personnel safety procedures and hangar equipment were well below that of air carrier maintenance. [Czepiel \(2003\)](#) also suggests that outsourced repair stations have not yet reached airline standards for developing maintenance human factors and maintenance resource management programs. These arguments reinforce the idea that, to overcome such disorganization mentioned by [Quinlan et al. \(2013\)](#), it is necessary to establish a good set of aircraft maintenance management practices that address safety problems while improving adherence to legal requirements and management practices that promote safety.

Therefore, based on these arguments, the following research question arises: “Are outsourced aircraft maintenance organizations implementing appropriate safety and good practices for aeronautical maintenance management?”

This study aims to answer the question and assess the maintenance management systems of aeronautical repair stations in Brazil regarding their alignment with aeronautical maintenance management practices (MMP) and identify which managerial factors are more relevant for the repair stations. A qualitative exploratory study design is used to investigate MMP in Brazilian subcontracted organizations. To precede this assessment, based on literature review, seven maintenance management factors are generated that affect aeronautical maintenance outcomes. Guided by these factors, a questionnaire with a five-point Likert scale was applied to Brazilian aeronautical maintenance organizations to collect data.

This paper begins with a theoretical framework (Section 2) about aeronautical maintenance and the Brazilian context of aeronautical maintenance, and Section 3 covers the methodology. Section 4 describes the results and discussion. Finally, conclusions are presented in Section 5.

2. Theoretical framework

2.1. Aeronautical maintenance

The type of maintenance to be performed on aircraft, and its equivalent costs, vary according to certain factors such as the generation of the aircraft, age, frequency of use, fleet composition, route of aircraft operation, operating practices of the company when periodically checking the aircraft maintenance philosophy of the company and maintenance planning versus maximizing the availability of the aircraft ([Kinnison, 2004](#)). Maintenance activities

can be performed “in house” by the operating company or can be outsourced ([Machado et al., 2015](#)). Depending on the conditions of the airline, such as available labor, infrastructure hangar and business scope, the company may choose to partially outsource maintenance activities, including those that need more structure or specialization. The tasks to be outsourced vary from company to company, but the aim is to keep the fleet of aircraft flight available for the longest period of time at the lowest cost, given the safety questions and in accordance with the regulatory standards of the country ([Al-Kaabi et al., 2007](#); [Czepiel, 2003](#); [Gregson et al., 2015](#); [Quinlan et al., 2014, 2013](#)). ICAO defines the concept of safety within the context of aviation as “the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management” ([ICAO, 2013b](#)).

An Aircraft Maintenance Organization (AMO) is often referred to as maintenance, repair and overhaul (MRO) ([Shanmugam and Paul Robert, 2015](#)). The main role of the MRO of an airline is to provide a fully serviceable aircraft when it is required by the operators at minimum cost and optimum quality ([Al-Kaabi et al., 2007](#)). It is reasonable to expect that all MRO have a robust maintenance management system.

Maintenance management is a systematic approach to planning, organizing, monitoring and evaluating maintenance activities and their costs ([Abudayyeh et al., 2005](#)). [Knotts \(1999\)](#) stated, in the aviation context, that maintenance activities are those actions required to return an item to working condition, including services, repairs, modifications, inspections and determination of the current state of the aircraft or its parts, making maintenance management more complex. According to [Holloway \(2008\)](#), aircraft maintenance accounts for a major cost of airline operations, significantly contributes to the security, availability, pricing of passenger travel, and integrity of business operation ([Regattieri et al., 2015](#)). Maintenance should aim to ensure the aircraft (or fleet) is in good condition, both internally and externally, when and where it is needed and at the lowest cost, while complying with all security variables ([Al-Kaabi et al., 2007](#); [Belien et al., 2012](#); [Czepiel, 2003](#)). One of the practices aimed at keeping costs competitive is the outsourcing of aircraft maintenance, repair, and overhaul (MRO), either domestically or to foreign countries ([Tang and Elias, 2012](#)). The treatment of costs involved with maintenance and repair overhaul (MRO) are generally calculated using the Available Seat-Mile (ASM), varying according to the use of the aircraft, its occupation and the efficiency of maintenance activities ([Holloway, 2008](#)). An alternative way of examining these maintenance values is calculating the total cost of ownership divided by block-hour (the extent of aircraft use that considers the period between closing of the door of the aircraft at the gate to takeoff and opening the door of the aircraft door upon gate arrival) ([Kinnison, 2004](#)). Therefore, despite the importance of safety and the quality for aircraft maintenance, cost has been a major factor reinforcing the statement that the best maintenance management practices are being neglected, for example, due to the cost reduction.

Based on the above information, it is clear that aircraft maintenance must ensure the availability of aircraft, infrastructure, schedule, cost, quality, safety and compliance with regulatory agencies.

2.2. Brazilian context of aeronautical maintenance

The National Civil Aviation Agency (ANAC) aims to promote the safety and excellence of the civil aviation system to contribute to the development and welfare of Brazilian society. Therefore, it is incumbent to establish and oversee compliance with the regulatory

Download English Version:

<https://daneshyari.com/en/article/7435516>

Download Persian Version:

<https://daneshyari.com/article/7435516>

[Daneshyari.com](https://daneshyari.com)