Chapter 2
Emerging Role of Artificial Intelligence (AI) in Aviation:
Using Predictive Maintenance for Operational Efficiency

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ABSTRACT

This book chapter offers an examination of the transformative influence of Artificial Intelligence (AI) within the aviation sector, focusing specifically on its application in predictive maintenance for enhancing operational efficiency. Through the investigation of current research and industry trends, and the utilization of a literature review as its methodological framework, this chapter elucidates the transformative impact of AI-driven predictive maintenance strategies on aviation operations. It explores how AI algorithms analyze vast amounts of data to predict potential equipment failures, enabling proactive maintenance interventions that minimize downtime and optimize fleet performance, presenting an analysis of the implications of AI integration in aviation. Notably, the integration of AI-driven technologies in critical areas such as flight planning, predictive maintenance, and air traffic management is highlighted, showcasing the significant advancements that have reshaped the aviation landscape. Furthermore, the chapter adopts a user-centric perspective, offering a critical assessment of the challenges and considerations inherent in AI implementation in aviation. This includes examining issues pertaining to human-machine interaction, trust in AI systems, and the evolving dynamics of job roles within the industry. Overall, the chapter provides a comprehensive overview of AI's impact on aviation, offering valuable insights for aviation professionals, policymakers, and researchers seeking a deeper understanding of the profound changes driven by AI within the aviation domain.

INTRODUCTION

As the aviation industry continues to embrace digital transformation, the integration of artificial intelligence (AI) and data analytics has emerged as a game-changer. The rapid advancement of digital technologies has brought about significant transformations across various industries, and the air transportation sector is no exception. The technological revolution introduced in the aviation industry by AI redefines operational paradigms and efficiency benchmarks. Among the myriad applications of AI in aviation, predictive maintenance emerges as a pivotal domain, offering a proactive approach to preserving aircraft integrity and optimizing operations and decision-making. This chapter delves into the crucial domain of air traffic management (ATM) and explores how digital innovation is revolutionizing the way airspace is managed, flights are coordinated, and safety is ensured.

The integration of Artificial Intelligence (AI) in the aviation industry has introduced transformative changes, significantly affecting various stakeholders and the overall user experience. Benbya, Davenport, and Pachidi (2020) provides a comprehensive overview of the state of Artificial Intelligence (AI) in an organizational context, analyzing the key aspects of accessibility, technological impact, real-world experiences, and a brief list of challenges and opportunities, highlighting the ethical concerns and the potential of AI in enhancing decision-making for business transformation. Understanding the profound implications of AI implementation necessitates a comprehensive examination of existing research and studies.

This chapter embarks on a journey to explore the emerging role of AI in aviation, with a keen focus on its application in predictive maintenance. Through a nuanced examination of current practices, technological advancements, and industry insights, it aims to unravel the transformative potential of AI-driven predictive maintenance strategies. By delving into the intricacies of data analytics, machine learning algorithms, and real-time monitoring systems, the goal is to contribute to uncover how AI facilitates predictive insights that enable timely maintenance interventions, ultimately enhancing operational efficiency and aircraft reliability.

In the following pages, we will explore case studies, industry best practices, and technological innovations that showcase the tangible benefits of integrating AI into maintenance workflows. Moreover,

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