

Preface

The civil aviation system is a dynamic and complex system involving airlines, flights, airlines, airports and runways. There are many factors affecting the safety and efficiency of civil aviation system. Under the circumstance of limited resources, how to design, optimize and evaluate the resource allocation of civil aviation system will greatly improve its management science level. However, if the scheduling scheme of civil aviation system is only prepared manually, it is not only time-consuming and laborious, but also the experience scheme is hardly optimal. With the help of big data and artificial intelligence, it is possible to generate the design and optimization scheme of civil aviation system by using computers. The main goal of this book is to build mathematical models and design algorithms for several common types of civil aviation problems from an operations research perspective. Finally, an example is given to verify the validity of the model and algorithm. Another goal of this book is how to evaluate the operational efficiency of the civil aviation system, where the different objects would be scored based on the establishment of evaluation indicators. Finally, an example is given to verify the validity of this study.

The book is roughly organized into two parts. In the first part of the book, models and their algorithms for four civil aviation operation problem were proposed. Chapter 1 specifically presented a multi-objective mixed integer linear programming model for green demand-responsive airport shuttle service with time-varying speeds. Chapter 2 described a multiple objective optimization model for aircraft arrival and departure scheduling on multiple runways. Chap-

ter 3 described a multi-objective optimization model for an aircraft flight scheduling problem for assigning a set of aircraft located at different airports to perform all flight trips. NSGA-II algorithm was also further developed to yield meta-optimal solutions to all three models within an acceptable time. Chapter 4 extended Chapter 3's study by considering an integrated optimization model for aircraft flight scheduling and routing problem (IAFSRP) to simultaneously determine the departure time of each flight trip, and assign a set of aircrafts located at different airports to perform all flight trips. This paper further presents a two-stage heuristic based on ant-colony-optimization (ACO) to efficiently yield acceptable solutions. In the second part of the book, Chapter 5 begins this part by building a novel group decision making model to evaluate the operational risk of airports from four aspects of human, equipment, management and environment factors.

Limited by the length and space of books and articles, each chapter only studies a simple civil aviation problem, and there are still many shortcomings to be further studied. All chapters are submitted, accepted or published in EI and SCI index journals, such as: Journal of Advanced Transportation (Chapter 1), Journal of Advanced Transportation (Chapter 2), Transport (Chapter 3), Mathematical Biosciences and Engineering (Chapter 4), Mathematical Biosciences and Engineering (Chapter 5). Due to the short time, there may be mistakes in the book, please criticize and correct them. We would also like to thank the people involved for their efforts and efforts in each chapter.