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# Design Of Aircraft



## Synopsis

The approach of this book is to demonstrate how theoretical aspects, drawn from topics on airplane aerodynamics, aircraft structures, stability and control, propulsion, and compressible flows, can be applied to produce a new conceptual aircraft design. The book cites theoretical expressions wherever possible, but also stresses the interplay of different aspects of the design which often require compromises. Coverage includes the conceptual design of an aircraft; iterative and repetitive calculations, and the different degrees of dependence of the aircraft characteristics on changing input conditions. For professionals in the Aerospace Engineering field.

## Book Information

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## Customer Reviews

Design of Aircraft is intended as a text for a senior-level (capstone) aerospace or aeronautics engineering course dealing with the conceptual design of aircraft. The approach is to demonstrate how theoretical aspects, drawn from topics on airplane aerodynamics, aircraft structures, stability and control, propulsion, and compressible flows can be applied to produce a new conceptual aircraft design. The book uses theoretical expressions wherever possible to seek optimums, but also stresses the interplay between different aspects of the design that often require compromises. As necessary, it draws on historical information to provide necessary input parameters, especially at an early stage of the design process. In addition, trends are used to provide checks on design elements to determine if they deviate too far from historical norms. A sample case study of a conceptual supersonic business jet runs through the chapters to illustrate each design step. Key

**Features of the Book** The process of the conceptual design of an aircraft is divided into 14 elements that are covered in sequential chapters. These range from the initial design proposal to the unit cost estimate. For each element, the degree of optimization based on design drivers can be examined. Microsoft Excel spreadsheets are included for each element of the design to perform iterative or repetitive calculations, and graph results. Each chapter contains a detailed description of the spreadsheet structure for that element, so that students can easily make modifications that suit their specific designs. In addition to the case study covered throughout the chapters, the Appendix includes two complete case studies with spreadsheets, for a large transport aircraft and a small kit aircraft. The chapters also contain individual problems that are designed to examine potential optimums and sensitivity of the different design elements to input parameters. Some of these problems are "open ended" and require interpretation and discussion.

This book is intended to be a text for a senior-level aerospace engineering course dealing with the conceptual design of aircraft. It is based on my experience in teaching the "capstone" design class in aerospace engineering for the past 15 years. The approach is to demonstrate how the theoretical aspects, drawn from topics on airplane aerodynamics, aircraft structures, stability and control, propulsion, and compressible flows, can be applied to produce a new conceptual aircraft design. The book cites theoretical expressions wherever possible, but also stresses the interplay of different aspects of the design, which often require compromises. As necessary, it draws on historical information to provide needed input parameters, especially at an early stage of the design process. In addition, historical aircraft are used to provide checks on design elements to determine if they deviate too far from historical norms. The process of the conceptual design of an aircraft is broken down into 14 steps. These are covered in Chapters 2 through 13. The book stresses the use of a spreadsheet approach for iterative and repetitive calculations. Sample spreadsheets, in Microsoft Excel, covering each step of the design are provided for each chapter, except 1 and 13. Each chapter also contains a detailed description of the spreadsheet structure, so that students can easily make modifications. In addition, the input conditions for each spreadsheet correspond to a cohesive conceptual design (supersonic business jet case study) that runs throughout the book. Each part of this case study that relates to the particular chapter topic is discussed at the end of each chapter. Two additional complete case studies that follow the steps outlined in the book are presented in Appendices B and C. In addition, there are individual problems at the end of each chapter in which the students are asked to utilize the spreadsheets to document different degrees of dependence of the aircraft characteristics on changing input conditions. Some of these problems are "open ended"

and require interpretation and discussion. The book can be used in either of two ways. First, it can be used to develop a complete conceptual design of a new aircraft. This is the way that I personally teach this material. Starting at the beginning, the students work in small groups and develop a complete design (similar to the case study) in a step-by-step fashion. This is accomplished over one semester (15 weeks). The second use of the book is to consider individual aspects of an aircraft without developing a complete design. This approach makes the best use of the problem sets at the end of each chapter. Using the spreadsheets, the effect of different input parameters can be easily investigated, and optimums can be sought. I know of a number of instructors who prefer this approach. The following is a list of chapters: Introduction Preliminary Estimate of Take-Off Weight Wing Loading Selection Main Wing Design Fuselage Design Horizontal and Vertical Tail Design Engine Selection Take-off and Landing Enhanced Lift Design Structural Design and Material Selection Static Stability and Control Cost Estimate Design Summary and Trade Study For a complete conceptual design, the chapters are intended to be followed in chronological order. A conscious attempt has been made to include within each chapter, all of the supplementary material that is needed to develop that aspect of the design. This minimizes the need to search for formulas or graphs in other chapters or references. Two of the chapters have combined topics that are often presented separately. One of these is the chapter on structural design. This chapter includes the load analysis, structure design, and material selection. Often material selection is treated separately; however placing it in a chapter on structure design reflects my experience that the two are inevitably tied together. The other chapter is "Static Stability and Control." This includes a section on refined weight estimate, which is also often presented separately. These have been grouped into a single chapter because the magnitude and placement of key weight components inherently affects the stability characteristics. The last chapter summarizes the case study that runs throughout the text and discusses the role of a Trade Study in a complete design. This is illustrated with the case study design and in the problems at the end of the chapter. THOMAS C. CORKS University of Notre Dame

An informative book, the various spreadsheets give you a interactive approach on how different aspects of aircraft design effect the overall design. However, the questions at the end of each chapter frequently contain typos, are poorly written, and in some cases just seem like poor questions. The integrity of the books contant seems good though.

This is a good book about aircraft design based on the case study of a Supersonic Buisness Jet

(SSBJ). Every classical topics is considered but there is nothing particular in this book. Except the specific case study, I don't think that there is anything new in this book that you can't find in other classical textbooks (Raymer or Roskam). There are several figures, all black and white, and this is a relatively small textbook. Certainly don't worth 200\$. If you want to read this book, don't buy it, go to your university library.

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