

**Mohammad H. Sadraey** 

# Aircraft Design A Systems Engineering Approach

**Second Edition** 

Aerospace Series



WILEY

## **Aircraft Design A Systems Engineering Approach**

**Mohammad H. Sadraey** 

#### Aircraft Design A Systems Engineering Approach:

Aircraft Design Mohammad H. Sadraey, 2012-11-20 A comprehensive approach to the air vehicle design process using the principles of systems engineering Due to the high cost and the risks associated with development complex aircraft systems have become a prime candidate for the adoption of systems engineering methodologies. This book presents the entire process of aircraft design based on a systems engineering approach from conceptual design phase through to preliminary design phase and to detail design phase Presenting in one volume the methodologies behind aircraft design this book covers the components and the issues affected by design procedures The basic topics that are essential to the process such as aerodynamics flight stability and control aero structure and aircraft performance are reviewed in various chapters where required Based on these fundamentals and design requirements the author explains the design process in a holistic manner to emphasise the integration of the individual components into the overall design Throughout the book the various design options are considered and weighed against each other to give readers a practical understanding of the process overall Readers with knowledge of the fundamental concepts of aerodynamics propulsion aero structure and flight dynamics will find this book ideal to progress towards the next stage in their understanding of the topic Furthermore the broad variety of design techniques covered ensures that readers have the freedom and flexibility to satisfy the design requirements when approaching real world projects Key features Provides full coverage of the design aspects of an air vehicle including aeronautical concepts design techniques and design flowcharts Features end of chapter problems to reinforce the learning process as well as fully solved design examples at component level Includes fundamental explanations for aeronautical engineering students and practicing engineers Features a solutions manual to sample questions on the book s companion website Companion website www wiley com go sadraey Aircraft Performance Mohammad H. Sadraey, 2023-07-14 Aircraft Performance An Engineering Approach Second Edition introduces flight performance analysis techniques of fixed wing air vehicles particularly heavier than aircraft It covers maximum speed absolute ceiling rate of climb range endurance turn performance and takeoff run Enabling the reader to analyze the performance and flight capabilities of an aircraft by utilizing only the aircraft weight data geometry and engine characteristics this book covers the flight performance analysis for both propeller driven and jet aircraft The second edition features new content on vertical takeoff and landing UAV launch UAV recovery use of rocket engine as the main engine range for electric aircraft electric engine endurance for electric aircraft gliding flight pull up and climb turn In addition this book includes end of chapter problems MATLAB code and examples and case studies to enhance and reinforce student understanding This book is intended for senior undergraduate aerospace students taking courses in Aircraft Performance Flight Dynamics and Flight Mechanics Instructors will be able to utilize an updated Solutions Manual and Figure Slides for their course Aircraft Design Mohammad H. Sadraey, 2024-10-15 Learn the aircraft design process from a systems engineering perspective designed for both aspiring and practicing aerospace

engineers Aircraft design incorporates a range of technological areas including aerodynamics flight dynamics propulsion and structure Aircraft engineering design therefore requires techniques from systems engineering to integrate the requirements from these disparate areas into a coherent whole There has never been a greater need for successful aerospace engineers to have a grasp of systems engineering and its applications in the field Aircraft Design A Systems Engineering Approach meets this need with a volume which takes the reader from conceptual design to detail design Offering a systems engineering approach that weighs the needs of different aircraft components holistically it provides readers with a practical look into the process of aircraft design Now fully updated to reflect the latest industry developments it promises to continue as an indispensable tool for modern students in the field Readers of the second edition of Aircraft Design will also find Brand new material on structural design spoiler design winglets aircraft modification and modernization and more Detailed discussion of emerging topics including all electric aircraft design VTOL aircraft design and many others Guidance on the latest FAA requirements with a design impact Aircraft Design is ideal for senior undergraduate and graduate students interested in aircraft design advanced aircraft design and air vehicle design The book may also be of interest to mechanical industrial and systems engineers working in the aerospace sector **Unmanned Aircraft Design** Mohammad Sadraey, 2017-09-19 This book provides fundamental principles design procedures and design tools for unmanned aerial vehicles UAVs with three sections focusing on vehicle design autopilot design and ground system design. The design of manned aircraft and the design of UAVs have some similarities and some differences. They include the design process constraints e.g. g load pressurization and UAV main components autopilot ground station communication sensors and payload A UAV designer must be aware of the latest UAV developments current technologies know lessons learned from past failures and they should appreciate the breadth of UAV design options The contribution of unmanned aircraft continues to expand every day and over 20 countries are developing and employing UAVs for both military and scientific purposes A UAV system is much more than a reusable air vehicle or vehicles UAVs are air vehicles they fly like airplanes and operate in an airplane environment They are designed like air vehicles they have to meet flight critical air vehicle requirements A designer needs to know how to integrate complex multi disciplinary systems and to understand the environment the requirements and the design challenges and this book is an excellent overview of the fundamentals from an engineering perspective This book is meant to meet the needs of newcomers into the world of UAVs The materials are intended to provide enough information in each area and illustrate how they all play together to support the design of a complete UAV Therefore this book can be used both as a reference for engineers entering the field or as a supplementary text for a UAV design course to provide system level context for each specialized topic

Design of Unmanned Aerial Systems Mohammad H. Sadraey, 2020-02-20 Provides a comprehensive introduction to the design and analysis of unmanned aircraft systems with a systems perspective Written for students and engineers who are new to the field of unmanned aerial vehicle design this book teaches the many UAV design techniques being used today and

demonstrates how to apply aeronautical science concepts to their design Design of Unmanned Aerial Systems covers the design of UAVs in three sections vehicle design autopilot design and ground systems design in a way that allows readers to fully comprehend the science behind the subject so that they can then demonstrate creativity in the application of these concepts on their own It teaches students and engineers all about UAV classifications design groups design requirements mission planning conceptual design detail design and design procedures It provides them with in depth knowledge of ground stations power systems propulsion systems automatic flight control systems guidance systems navigation systems and launch and recovery systems Students will also learn about payloads manufacturing considerations design challenges flight software microcontroller and design examples In addition the book places major emphasis on the automatic flight control systems and autopilots Provides design steps and procedures for each major component Presents several fully solved step by step examples at component level Includes numerous UAV figures images to emphasize the application of the concepts Describes real stories that stress the significance of safety in UAV design Offers various UAV configurations geometries and weight data to demonstrate the real world applications and examples Covers a variety of design techniques processes such that the designer has freedom and flexibility to satisfy the design requirements in several ways Features many end of chapter problems for readers to practice Design of Unmanned Aerial Systems is an excellent text for courses in the design of unmanned aerial vehicles at both the upper division undergraduate and beginning graduate levels **Design** Mohammad H. Sadraey, 2024-09-07 This book provides fundamental principles design procedures and design tools for unmanned aerial vehicles UAVs with three sections focusing on vehicle design autopilot design and ground system design The design of manned aircraft and the design of UAVs have some similarities and some differences. They include the design process constraints e q q load pressurization and UAV main components autopilot ground station communications system sensors and payload A UAV designer must be aware of the latest UAV developments current technologies know lessons learned from past failures and they should appreciate the breadth of UAV design options The contribution of unmanned aircraft continues to expand every day and over 67 countries are developing and employing UAVs for both military and civil scientific purposes A UAV system is much more than a reusable air vehicle or vehicles UAVs are air vehicles they fly like airplanes and operate in an airplane environment They are designed like air vehicles they have to meet critical air vehicle requirements A designer needs to know how to integrate complex multi disciplinary systems and to understand the environment the requirements and the design challenges and this book is an excellent overview of the fundamentals from an engineering perspective This book is meant to meet the needs of newcomers into the world of UAVs The materials are intended to provide enough information in each area and illustrate how they all play together to support the design of a complete UAV Therefore this book can be used both as a reference for engineers entering the field or as a supplementary text for a UAV design course to provide system level context for each specialized topic The second edition is extensively

revised Some of the new terminologies concepts and specific unmanned aircraft systems are introduced The revisions make the book clearer and easier to understand and will add number of new subjects in areas that have become more prominent in the unmanned aviation world Design of Unmanned Aerial Systems Mohammad H. Sadraev, 2020-04-13 Provides a comprehensive introduction to the design and analysis of unmanned aircraft systems with a systems perspective Written for students and engineers who are new to the field of unmanned aerial vehicle design this book teaches the many UAV design techniques being used today and demonstrates how to apply aeronautical science concepts to their design Design of Unmanned Aerial Systems covers the design of UAVs in three sections vehicle design autopilot design and ground systems design in a way that allows readers to fully comprehend the science behind the subject so that they can then demonstrate creativity in the application of these concepts on their own It teaches students and engineers all about UAV classifications design groups design requirements mission planning conceptual design detail design and design procedures It provides them with in depth knowledge of ground stations power systems propulsion systems automatic flight control systems guidance systems navigation systems and launch and recovery systems Students will also learn about payloads manufacturing considerations design challenges flight software microcontroller and design examples In addition the book places major emphasis on the automatic flight control systems and autopilots Provides design steps and procedures for each major component Presents several fully solved step by step examples at component level Includes numerous UAV figures images to emphasize the application of the concepts Describes real stories that stress the significance of safety in UAV design Offers various UAV configurations geometries and weight data to demonstrate the real world applications and examples Covers a variety of design techniques processes such that the designer has freedom and flexibility to satisfy the design requirements in several ways Features many end of chapter problems for readers to practice Design of Unmanned Aerial Systems is an excellent text for courses in the design of unmanned aerial vehicles at both the upper division undergraduate and beginning **Systems Engineering for Aerospace** Richard Sheng, 2019-02-23 Systems Engineering for Aerospace A graduate levels Practical Approach applies insights gained from systems engineering to real world industry problems The book describes how to measure and manage an aircraft program from start to finish It helps readers determine input process and output requirements from planning to testing Readers will learn how to simplify design through production and acquire a lifecycle strategy using Integrated Master Plan Schedule IMP IMS The book directly addresses improved aircraft system design tools and processes which when implemented contribute to simpler lower cost and safer airplanes The book helps the reader understand how a product should be designed identifying the customer's requirements considering all possible components of an integrated master plan and executing according to the plan with an integrated master schedule The author demonstrates that systems engineering offers a means for aircraft companies to become more effective and profitable Describes how to measure and manage an aircraft program Instructs on how to determine essential input process and output requirements Teaches how to simplify the design process thus allowing for increased profit Provides a lifecycle strategy using Integrated Master Plan Schedule IMP IMS Identifies cost driver influences on people products and processes

Modelling and Managing Airport Performance Konstantinos Zografos, Giovanni Andreatta, Amedeo Odoni, 2013-06-17 Modelling and Managing Airport Performance provides an integrated view of state of the art research on measuring and improving the performance of airport systems with consideration of both airside and landside operations The considered facets of performance include capacity delays economic costs noise emissions and safety Several of the contributions also examine policies for managing congestion and allocating sparse capacity as well as for mitigating the externalities of noise emissions and safety risk Key features Provides a global perspective with contributing authors from Europe North and South America with backgrounds in academia research institutions government and industry Contributes to the definition interpretation and shared understanding of airport performance measures and related concepts Considers a broad range of measures that quantify operational and environmental performance as well as safety and risk Discusses concepts and strategies for dealing with the management of airport performance Presents state of the art modelling capabilities and identifies future modelling needs Themed around 3 sections Modelling Airport Performance Assessing Airport Impacts and Managing Airport Performance and Congestion Modelling and Managing Airport Performance is a valuable reference for researchers and practitioners in the global air transportation community Handbook of Model-Based Systems Engineering Azad M. Madni, Norman Augustine, Michael Sievers, 2023-07-25 This handbook brings together diverse domains and technical competences of Model Based Systems Engineering MBSE into a single comprehensive publication It is intended for researchers practitioners and students educators who require a wide ranging and authoritative reference on MBSE with a multidisciplinary global perspective It is also meant for those who want to develop a sound understanding of the practice of systems engineering and MBSE and or who wish to teach both introductory and advanced graduate courses in systems engineering It is specifically focused on individuals who want to understand what MBSE is the deficiencies in current practice that MBSE overcomes where and how it has been successfully applied its benefits and payoffs and how it is being deployed in different industries and across multiple applications MBSE engineering practitioners and educators with expertise in different domains have contributed chapters that address various uses of MBSE and related technologies such as simulation and digital twin in the systems lifecycle The introductory chapter reviews the current state of practice discusses the genesis of MBSE and makes the business case Subsequent chapters present the role of ontologies and meta models in capturing system interdependencies reasoning about system behavior with design and operational constraints the use of formal modeling in system model verification and validation ontology enabled integration of systems and system of systems digital twin enabled model based testing system model design synthesis model based tradespace exploration design for reuse human system integration and role of simulation and Internet of Things IoT within MBSE

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