# Aircraft Conceptual Design Synthesis

by

Denis Howe PhD (Cranfield), SM (MIT), FRAeS, FIMechE

Professor Emeritus and formerly Head of the College of Aeronautics, and Dean of Engineering, Cranfield University



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# <u>Aircraft Conceptual Design Synthesis Aerocastle</u>

Pierre-André Fruytier

### Aircraft Conceptual Design Synthesis Aerocastle:

Aircraft Conceptual Design Synthesis Denis Howe, 2000 Aircraft Conceptual Design Synthesis means design by fitness for purpose Design engineers can jump off from the point of given parameters and requirements required performance payloads and other factors This is the first book for the aeronautical designer devoted to guiding the reader through this highly effective conceptual design synthesis process This forms the procedure for the initial stage of the aircraft design process the interpretation of a requirement into the preliminary layout A logical design sequence is developed utilizing original modules to represent propulsion lift drag mass and performance Aircraft Conceptual Design Synthesis includes a disk of spreadsheets that provides core data Unlike existing approaches the design synthesis method can be applied to novel aircraft concepts CONTENTS INCLUDE The design process Aircraft configuration Flight regime and powerplant considerations Fuselage layout Configuration of the wing Basic lift drag and mass representations Performance estimation Parametric analysis and optimisation Analysis of concept design This is an important landmark book and in my view will become a standard by which others will be compared Dr E C P Ransom Kingston University UK *Integration of Aircraft* Systems Into Conceptual Design Synthesis Tim Lammering, 2014 Conceptual Design Synthesis and Optimization for New Generations of Combat Aircraft Frank Siegers, 1996 Synthesis of Subsonic Airplane Design E. Torenbeek, 2013-06-29 Since the education of aeronautical engineers at Delft University of Technology started in 1940 under tae inspiring leadership of Professor H J van der Maas much emphasis has been placed on the design of aircraft as part of the student s curriculum Not only is aircraft design an optional subject for thesis work but every aeronautical student has to carry out a preliminary airplane design in the course of his study. The main purpose of this preliminary design work is to enable the student to synthesize the knowledge ob tained separately in courses on aerodynamics aircraft performances stability and con trol aircraft structures etc The student s exercises in preliminary design have been directed through the years by a number of staff members of the Department of Aerospace Engineering in Delft The author of this book Mr E Torenbeek has made a large contribution to this part of the study programme for many years Not only has he acquired vast experience in teaching airplane design at university level but he has also been deeply involved in design oriented re search e g developing rational design methods and systematizing design information I am very pleased that this wealth of experience methods and data is now presented in this book Analysis and Synthesis of Aircraft Configurations During Conceptual Design Using an Advanced Morphological Approach A. Bardenhagen, D. Rakov, 2019 Numerical Synthesis Methodology for Conceptual Design of New Generations of Combat Aircraft Frank Siegers, 1995 Introduction to aircraft design synthesis and analysis R. Shevell, I. Kroo, Department of Aeronautics and Astronautics, Stanford University, 1992 Advanced **Aircraft Design** Egbert Torenbeek, 2013-05-28 Although the overall appearance of modern airliners has not changed a lot since the introduction of jetliners in the 1950s their safety efficiency and environmental friendliness have improved

considerably Main contributors to this have been gas turbine engine technology advanced materials computational aerodynamics advanced structural analysis and on board systems Since aircraft design became a highly multidisciplinary activity the development of multidisciplinary optimization MDO has become a popular new discipline Despite this the application of MDO during the conceptual design phase is not yet widespread Advanced Aircraft Design Conceptual Design Analysis and Optimization of Subsonic Civil Airplanes presents a quasi analytical optimization approach based on a concise set of sizing equations Objectives are aerodynamic efficiency mission fuel empty weight and maximum takeoff weight Independent design variables studied include design cruise altitude wing area and span and thrust or power loading Principal features of integrated concepts such as the blended wing and body and highly non planar wings are also covered The quasi analytical approach enables designers to compare the results of high fidelity MDO optimization with lower fidelity methods which need far less computational effort Another advantage to this approach is that it can provide answers to what if questions rapidly and with little computational cost Key features Presents a new fundamental vision on conceptual airplane design optimization Provides an overview of advanced technologies for propulsion and reducing aerodynamic drag Offers insight into the derivation of design sensitivity information Emphasizes design based on first principles Considers pros and cons of innovative configurations Reconsiders optimum cruise performance at transonic Mach numbers Advanced Aircraft Design Conceptual Design Analysis and Optimization of Subsonic Civil Airplanes advances understanding of the initial optimization of civil airplanes and is a must have reference for aerospace engineering students applied researchers aircraft design engineers and analysts A Direct Synthesis Method for the Conceptual Design of Transport Aircraft Pierre-André Fruytier, 1995 The problem of synthesizing aircraft at the conceptual design level is considered A direct sizing algorithm that does not require iteration is developed Such direct synthesis methods can be used as important building blocks in an aircraft optimization process Leaf v Knowledge-Based Integrated Aircraft Design Raghu Chaitanya Munjulury, 2017-05-23 The design and development of new aircraft are becoming increasingly expensive and timeconsuming To assist the design process in reducing the development cost time and late design changes the conceptual design needs enhancement using new tools and methods Integration of several disciplines in the conceptual design as one entity enables to keep the design process intact at every step and obtain a high understanding of the aircraft concepts at early stages This thesis presents a Knowledge Based Engineering KBE approach and integration of several disciplines in a holistic approach for use in aircraft conceptual design KBE allows the reuse of obtained aircrafts data information and knowledge to gain more awareness and a better understanding of the concept under consideration at early stages of design For this purpose Knowledge Based KB methodologies are investigated for enhanced geometrical representation and enable variable fidelity tools and Multidisciplinary Design Optimization MDO The geometry parameterization techniques are qualitative approaches that produce quantitative results in terms of both robustness and flexibility of the design parameterization The information

parameters from all tools disciplines and the design intent of the generated concepts are saved and shared via a central database The integrated framework facilitates multi fidelity analysis combining low fidelity models with high fidelity models for a quick estimation enabling a rapid analysis and enhancing the time for a MDO process The geometry is further propagated to other disciplines Computational Fluid Dynamics CFD Finite Element Analysis FEA for analysis This is possible with an automated streamlined process for CFD FEM system simulation to analyze and increase knowledge early in the design process Several processes were studied to streamline the geometry for CFD Two working practices one for parametric geometry and another for KB geometry are presented for automatic mesh generation It is observed that analytical methods provide quicker weight estimation of the design and when coupled with KBE provide a better understanding Integration of 1 D and 3 D models offers the best of both models faster simulation and superior geometrical representation To validate both the framework and concepts generated from the tools they are implemented in academia in several courses at Link ping University and in industry Synthesis of Subsonic Airplane Design E. Torenbeek, 2014-01-15 Aircraft Conceptual Design Optimization Using Genetic Search Based on Return on Investment Kevin C. Downs, 1996 Design of Aircraft Thomas C. Corke, 2003 For senior level Aerospace Engineering students dealing with the conceptual design of aircraft 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 Conceptual Aircraft Design Ajoy Kumar Kundu, Mark A. Price, David Riordan, 2019-01-02 Provides a Comprehensive Introduction to Aircraft Design with an Industrial Approach This book introduces readers to aircraft design placing great emphasis on industrial practice It includes worked out design examples for several different classes of aircraft including Learjet 45 Tucano Turboprop Trainer BAe Hawk and Airbus A320 It considers performance substantiation and compliance to certification requirements and market specifications of take off landing field lengths initial climb high speed cruise turning capability and payload range Military requirements are discussed covering some aspects of combat as is operating cost estimation methodology safety considerations environmental issues flight deck layout avionics and more general aircraft systems The book also includes a chapter on electric aircraft design along with a full range of industry standard aircraft sizing analyses Split into two parts Conceptual Aircraft Design An Industrial Approach spends the first part dealing with the pre requisite information for configuring aircraft so that readers can make informed decisions when designing vessels The second part devotes itself to new aircraft concept definition It also offers additional analyses and design information e g on cost manufacture systems role of CFD etc integral to conceptual design study The book finishes with an introduction to electric aircraft and futuristic design concepts currently under study Presents an informative industrial approach to aircraft design Features design examples for aircraft such as the Learjet 45

Tucano Turboprop Trainer BAe Hawk Airbus A320 Includes a full range of industry standard aircraft sizing analyses Looks at several performance substantiation and compliance to certification requirements Discusses the military requirements covering some combat aspects Accompanied by a website hosting supporting material Conceptual Aircraft Design An Industrial Approach is an excellent resource for those designing and building modern aircraft for commercial military and Aircraft Design Daniel P. Raymer, 2006 Winner of the Summerfield Book Award Winner of the Aviation Space Writers Association Award of Excellence Over 30 000 copies sold consistently the top selling AIAA textbook title This highly regarded textbook presents the entire process of aircraft conceptual designfrom requirements definition to initial sizing configuration layout analysis sizing and trade studies in the same manner seen in industry aircraft design groups Interesting and easy to read the book has more than 800 pages of design methods illustrations tips explanations and equations and extensive appendices with key data essential to design It is the required design text at numerous universities around the world and is a favorite of practicing design engineers Aircraft Design Daniel P. Raymer, 2012 This book presents the entire process of aircraft conceptual design from requirements definition to initial sizing configuration layout analysis sizing optimization and trade studies A virtual encyclopaedia of engineering it is known for its completeness easy to read style and real world approach to the process of design Aircraft Conceptual Design Methods Paul Berry, 2005

<u>Aircraft Conceptual Design</u> Daniel P. Raymer,2007 **An Expert System for Aircraft Conceptual Design** Michael James Logan,ProQuest Dissertations and Theses (Electronic resource collection),University of Texas at Arlington. College of Engineering,1988 **A New Architecture and Expert System for Aircraft Design Synthesis** Masami Takai,1990

The Top Books of the Year Aircraft Conceptual Design Synthesis Aerocastle The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of popular books, exploring the captivating narratives that have captivated audiences this year. Aircraft Conceptual Design Synthesis Aerocastle: Colleen Hoovers "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover skillfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can succeed. Uncover the Best: Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This spellbinding historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic: Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens crafts a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a guiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and gripping novel that will keep you speculating until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

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