Aerodynamic Optimization Of Coaxial Rotor In Hover Icas

NOELLE CLARA

2023 Asia-Pacific International Symposium on Aerospace Technology (APISAT 2023) Proceedings Cambridge University Press
This book presents the select proceedings of the first International Conference on Energy and Materials Technologies (ICEMT) 2021, organized by the Department of Mechanical Engineering, Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam, India. It covers the recent technologies in two broad thematic areas: energy and materials. Various topics covered in this book include advanced materials and characterization, mechanical behavior of materials, nanomaterials and nanotechnology, biomaterials, composite materials, environmental-friendly materials, structural materials, advances in aerospace technology, and advanced materials and manufacturing. The book is useful for students, researchers, and professionals in the area of mechanical engineering, especially various domains of materials.
Airframe Structural Dynamic Considerations in Rotor Design Optimization Springer Nature
This book addresses the topic of autonomous flying robots physically interacting with the environment under the influence of wind. It aims to make aerial robots aware of the disturbance, interaction, and faults acting on them. This requires reasoning about the external wrench (force and torque) acting on the robot and distinguishing between wind, interactions, and collisions. The book takes a model-based approach and covers a systematic approach to parameter identification for flying robots. The book aims to provide a wind speed estimate independent of the external wrench, including estimating the wind speed using motor power measurements. Aerodynamics modeling is approached in a data-driven fashion, using ground-truth measurements from a 4D wind tunnel. Finally, the book bridges the gap between trajectory tracking and interaction control, to allow physical interaction under wind influence. Theoretical results are accompanied by extensive simulation and experimental results.
New Results in Numerical and Experimental Fluid Mechanics XIII Courier Corporation
An extremely practical overview of V/STOL (vertical/short takeoff and landing) aerodynamics, this volume offers a presentation of general theoretical and applied aerodynamic principles, covering propeller and helicopter rotor theory for both the static and forward flight cases. Both a text for students and a reference for professionals, the book can be used for advanced undergraduate or graduate courses. Numerous detailed figures, plus exercises. 1967 edition. Preface. Appendix. Index.
Aeronautical Engineering Cambridge University Press
This book offers timely insights into research on numerical and experimental fluid mechanics and aerodynamics, mainly for (but not limited to) aerospace applications. It reports on findings by members of the STAB (German Aerospace Aerodynamics Association) and DGLR (German Society for Aeronautics and Astronautics) and covers both nationally and EC-funded projects. Continuing on the tradition of the previous volumes, the book highlights innovative solutions, promoting translation from fundamental research to industrial applications. It addresses academics and professionals

in the field of aeronautics, astronautics, ground transportation, and energy alike.

The Variational Method for Aerodynamic Optimization Using the Navier-Stokes Equations IOS Press

The power requirements measured in static thrust and in level forward flight are presented for two helicopter rotor configurations. One is a coaxial rotor arrangement having the rotors spaced approximately 19 percent of the rotor radius; the other is a tandem configuration in which the rotor-shaft spacing is 3 percent greater than the rotor daimater and in which the rotors lie in the same plane. The experimental meausrements are compared with the results of calculations based on existing NACA single-rotor theory.

Helicopter Performance John Wiley & Sons

Written by an internationally recognized teacher and researcher, this book provides a thorough, modern treatment of the aerodynamic principles of helicopters and other rotating-wing vertical lift aircraft such as tilt rotors and autogiros. The text begins with a unique technical history of helicopter flight, and then covers basic methods of rotor aerodynamic analysis, and related issues associated with the performance of the helicopter and its aerodynamic design. It goes on to cover more advanced topics in helicopter aerodynamics, including airfoil flows, unsteady aerodynamics, dynamic stall, and rotor wakes, and rotor-airframe aerodynamic interactions, with final chapters on autogiros and advanced methods of helicopter aerodynamic analysis. Extensively illustrated throughout, each chapter includes a set of homework problems. Advanced undergraduate and graduate students, practising engineers, and researchers will welcome this thoroughly revised and updated text on rotating-wing aerodynamics.

Aerodynamic Optimization of Turbine Airfoils Using Multi-Fidelity Surrogate Models Springer Science & Business Media

This book is a monograph on aerodynamics of aero-engine gas turbines focusing on the new progresses on flow mechanism and design methods in the recent 20 years. Starting with basic principles in aerodynamics and thermodynamics, this book systematically expounds the recent research on mechanisms of flows in axial gas turbines, including high pressure and low pressure turbines, inter-turbine ducts and turbine rear frame ducts, and introduces the classical and innovative numerical evaluation methods in different dimensions. This book also summarizes the latest research achievements in the field of gas turbine aerodynamic design and flow control, and the multidisciplinary conjugate problems involved with gas turbines. This book should be helpful for scientific and technical staffs, college teachers, graduate students, and senior college students, who are involved in research and design of gas turbines.

Aeromechanics Analysis of Counter-Rotating Coaxial Rotor Systems Springer

This design guide was written to capture the author’s practical experience of designing, building and testing multi-rotor drone systems over the past decade. The lack of one single source of useful information meant that the past 10 years has been a steep learning curve, a lot of self-tuition and many trial and error tests. Lessons learnt the hard way are not always the best way to learn. This book will be useful for the amateur drone pilot who wants to build their own system from first principles, as well as the academic researcher investigating novel design concepts and future drone applications.

Unmanned Rotorcraft Systems ScholarlyEditions

This book constitutes the refereed proceedings of the 9th International Conference on Engineering Psychology and Cognitive Ergonomics, EPCE 2011, held in Orlando, FL, USA, in July 2011, within the framework of the 14th International Conference on Human-Computer Interaction, HCII 2011, together with 11 other thematically similar conferences. The 67 full papers presented were carefully reviewed and selected from numerous submissions. The papers are organized in topical parts on cognitive and psychological aspects of interaction; cognitive aspects of driving; cognition and the Web; cognition and automation; security and safety; and aerospace and military applications.

New Design Concepts for High Speed Air Transport Springer Nature

The book introduces the fundamentals of fluid-mechanics, momentum theories, vortex theories and vortex methods necessary for the study of rotors aerodynamics and wind-turbines aerodynamics in particular. Rotor theories are presented in a great level of details at the beginning of the book. These theories include: the blade element theory, the Kutta-Joukowski theory, the momentum theory and the blade element momentum method. A part of the book is dedicated to the description and implementation of vortex methods. The remaining of the book focuses on the study of wind turbine aerodynamics using vortex-theory analyses or vortex-methods. Examples of vortex-theory applications are: optimal rotor design, tip-loss corrections, yaw-models and dynamic inflow models. Historical derivations and recent extensions of the models are presented. The cylindrical vortex model is another example of a simple analytical vortex model presented in this book. This model leads to the development of different BEM models and it is also used to provide the analytical velocity field upstream of a turbine or a wind farm under aligned or yawed conditions. Different applications of numerical vortex methods are presented. Numerical methods are used for instance to investigate the influence of a wind turbine on the incoming turbulence. Sheared inflows and aero-elastic simulations are investigated using vortex methods for the first time. Many analytical flows are derived in details: vortex rings, vortex cylinders, Hill's vortex, vortex blobs etc. They are used throughout the book to devise simple rotor models or to validate the implementation of numerical methods. Several Matlab programs are provided to ease some of the most complex implementations.

Wind Turbine Aerodynamics and Vorticity-Based Methods Lulu.com

The recent appearance of the Kamov Ka-50 helicopter and the application of coaxial rotors to unmanned aerial vehicles have renewed international interest in the coaxial rotor configuration. This report addresses the aerodynamic issues peculiar to coaxial rotors by surveying American, Russian, Japanese, British, and German research. (Herein, 'coaxial rotors' refers to helicopter, not propeller, rotors. The intermeshing rotor system was not investigated.) Issues addressed are separation distance, load sharing between rotors, wake structure, solidity effects, swirl recovery, and the effects of having no tail rotor. A general summary of the coaxial rotor configuration explores the configuration's advantages and applications. Coleman, Colin P. Ames Research Center RTOP 522-31-12; RTOP 522-41-22...

A Survey of Theoretical and Experimental Coaxial Rotor Aerodynamic Research Springer Nature

Optimal aircraft design is impossible without a parametric representation of the geometry of the airframe. We need a mathematical model equipped with a set of controls, or design variables, which generates different candidate airframe shapes in response to changes in the values of these variables. This model's objectives are to be flexible and concise, and capable of yielding a wide range of shapes with a minimum number of design variables. Moreover, the process of converting these variables into aircraft geometries must be robust. Alas, flexibility, conciseness and robustness can seldom be achieved simultaneously. Aircraft Aerodynamic Design: Geometry and Optimization addresses this problem by navigating the subtle trade-offs between the competing objectives of geometry parameterization. It beginswith the fundamentals of geometry-centred aircraft design, followed by a review of the building blocks of computational geometries, the curve and surface formulations at the heart of aircraft geometry. The authors then cover a range of legacy formulations in the build-up towards a discussion of the most flexible shape models used in aerodynamic design (with a focus on lift generating surfaces). The book takes a practical approach and includes MATLAB®, Python and Rhinoceros® code, as well as 'real-life' example case studies. Key features: Covers effective geometry parameterization within the context of design optimization Demonstrates how geometry parameterization is an important element of modern aircraft design Includes code and case studies which enable the reader to apply each theoretical concept either as an aid to understanding or as a building block of their own geometry model Accompanied by a website hosting codes Aircraft Aerodynamic Design: Geometry and Optimization is a practical guide for researchers and practitioners in the aerospace industry, and a reference for graduate and undergraduate students in aircraft design and multidisciplinary design optimization.

Principles of Helicopter Aerodynamics with CD Extra Springer Science & Business Media

Issues in Transportation Research and Application: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Transport Geography. The editors have built Issues in Transportation Research and Application: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Transport Geography in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Transportation Research and Application: 2013 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Rotorcraft Aeromechanics Wiley-Blackwell

"This lecture series is devoted to major aspects of aerofoil design both for aeronautical and turbomachine application. These include: (1) optimisation of target pressure and velocity distribution. Both direct optimisation resulting from an inverse boundary layer calculation and an iterative optimisation of the loses are presented. (2) aerofoil design by means of inverse methods. This ranges from simple parametric definitions of two- dimensional cross sections to a detailed numerical definition of three dimensional shapes. blade or airfoil designs are normally made in two steps, and the lectures are accordingly grouped into two parts. First, optimisation of target pressure and velocity distributions are discussed taking into account the required performance and the lost mechanisms in the boundary layer. Both direct optimisation resulting from an inverse boundary layer calculation, and an iterative optimisation by minimisation of the losses are presented. It is clear from both procedures that inclusion of off-design operation is one of the greatest difficulties involved in blade or airfoil operation. The second part gives an overview of the numerous inverse blade design methods that have been developed both for turbomachinery and aeronautical applications. This ranges from simple parameter definitions of two-dimensional cross-sections to the full three-dimensional definition of wings and blade channels."--DTIC

Integrated Aerodynamic/dynamic Optimization of Helicopter Rotor Blades New Age International

A wind-tunnel investigation was conducted in which independent, steady-state aerodynamic forces and moments were measured on a 2.24-m-diam, two- bladed helicopter rotor and on several different bodies. The objective was to determine the mutual interaction effects for variations in velocity, thrust, tip-path-plane angle of attack, body angle of attack, rotor/body position, and body geometry. the results of the investigation show that the body longitudinal aerodynamic characteristics are significantly affected by the presence of a rotor and hub, and that the hub interference may be a major part of such interaction. This report presents the effects of various parameters on the interactions and discusses the difficulties encountered in determining the effect of the body on the rotor performance.

Helicopter Aerodynamics Volume II Springer

This book offers timely insights into research on numerical and experimental fluid mechanics and aerodynamics, mainly for (but not limited to) aerospace applications. It reports on findings by members of the STAB (German Aerospace Aerodynamics Association) and DGLR (German Society for Aeronautics and Astronautics) and covers both nationally and EC-funded projects. Continuing on the tradition of the previous volumes, the book highlights innovative solutions, promoting translation from fundamental research to industrial applications. It addresses academics and professionals in the field of aeronautics, astronautics, ground transportation, and energy alike.

Axial Turbine Aerodynamics for Aero-engines Springer

The first rotor performance predictions were published by Joukowsky exactly 100 years ago. Although a century of research has expanded the knowledge of rotor aerodynamics enormously, and modern computer power and measurement techniques now enable detailed analyses that were previously out of reach, the concepts proposed by Froude, Betz, Joukowsky and Glauert for modelling a rotor in performance calculations are still in use today, albeit with modifications and expansions. This book is the result of the author's curiosity as to whether a return to these models with a combination of mathematics, dedicated computations and wind tunnel experiments could yield more physical insight and answer some of the old questions still waiting to be resolved. Although most of the work included here has been published previously, the book connects the various topics, linking them in a coherent storyline. “The Fluid Dynamic Basis for Actuator Disc and Rotor Theories” was first published in 2018. This Revised Second Edition (2022) will be of interest to those working in all branches of rotor aerodynamics – wind turbines, propellers, ship screws and helicopter rotors. It has been written for proficient students and researchers, and reading it will demand a good knowledge of inviscid (fluid) mechanics. Jens Nørkær Sørensen, DTU, Technical University of Denmark: “(…) a great piece of work, which in a consistent way highlights many of the items that the author has worked on through the years. All in all, an impressive contribution to the classical work on propellers/wind turbines.” Peter Schaffarczyk, Kiel University of Applied Sciences, Germany: “(...) a really impressive piece of work!” Carlos Simão Ferreira, Technical University Delft: “This is a timely book for a new generation of rotor aerodynamicists from wind turbines to drones and personal air-vehicles. In a time where fast numerical solutions

for aerodynamic design are increasingly available, a clear theoretical and fundamental formulation of the rotor-wake problem will help professionals to evaluate the validity of their design problem. 'The Fluid Dynamic Basis for Actuator Disc and Rotor Theories' is a pleasure to read, while the structure, text and figures are just as elegant as the theory presented." The cover shows 'The Red Mill', by Piet Mondriaan, 1911, collection Gemeentemuseum Den Haag. Cover image: © 2022 Mondrian/Holtzman Trust.

The Fluid Dynamic Basis for Actuator Disc and Rotor Theories CRC Press

The aerodynamic characteristics of nontwisted-rotor-blade turbines are approximately those of free-vortex turbines intended for similar application for values of hub-tip-radius that are used in current turbines.

Rotor/body Aerodynamic Interactions Springer Nature

The NASA Dryden Flight Research Center is exploring the optimum thrust-vector angle on aircraft. Simple aerodynamic performance models for various phases of aircraft flight are developed and optimization equations and algorithms are presented in this report. Results of optimal angles of thrust vectors and associated benefits for various flight regimes of aircraft (takeoff, climb, cruise, descent, final approach, and landing) are given. Results for a typical wide-body transport aircraft are also given. The benefits accruable for this class of aircraft are small, but the technique can be applied to other conventionally configured aircraft. The lower L/D aerodynamic characteristics of fighters generally would produce larger benefits than those produced for transport aircraft.

New Results in Numerical and Experimental Fluid Mechanics XIII Matrix Publishers, Incorporated

Wind energy's bestselling textbook- fully revised. This must-have second edition includes up-to-date data, diagrams, illustrations and thorough new material on: the fundamentals of wind turbine aerodynamics; wind turbine testing and modelling; wind turbine design standards; offshore wind energy; special purpose applications, such as energy storage and fuel production. Fifty additional homework problems and a new appendix on data processing make this comprehensive edition perfect for engineering students. This book offers a complete examination of one of the most promising sources of renewable energy and is a great introduction to this cross-disciplinary field for practising engineers. "provides a wealth of information and is an excellent reference book for people interested in the subject of wind energy." (IEEE Power & Energy Magazine, November/December 2003) "deserves a place in the library of every university and college where renewable energy is taught." (The International Journal of Electrical Engineering Education, Vol.41, No.2 April 2004) "a very comprehensive and well-organized treatment of the current status of wind power." (Choice, Vol. 40, No. 4, December 2002)

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