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Aircraft Design

American Institute of Aeronautics and Astronautics Incorporated

"Aircraft Design: A Conceptual Approach, Sixth Edition by AIAA Fellow Dr. Daniel P. Raymer provides updates to what has become a standard textbook and reference throughout the world on the subject of aircraft conceptual design. This new edition expands and updates this modern classic including timely topics such as "green aircraft" and electric propulsion, but retains the completeness and readability that have placed it in universities and design offices everywhere. The book covers every topic necessary to the understanding of aircraft design, such as aerodynamics,

structures, stability and control, propulsion, etc., with an overview introduction starting from first principles. All are discussed from the point of view of the designer, not the specialist in any given topic area"--

Aircraft Design Amer

Inst of Aeronautics & Astronautics
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 design from 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

This textbook for advanced students focuses on industry design practice rather than theoretical definitions. Covers configuration layout, payload considerations, aerodynamics, propulsion, structure

and loads, weights, stability, and control, performance, and cost analysis. Annotation copyright Book

Aircraft Design John Wiley & Sons

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 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 • safety, efficiency and
Featuresend of chapter environmental
problems to reinforce friendliness have
the learning process as improved considerably.
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a 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

**Advanced Aircraft
Design** John Wiley &
Sons

Although the overall
appearance of modern
airliners has not
changed a lot since the
introduction of jetliners
in the 1950s, their

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.

Conceptual Aircraft Design John Wiley & Sons

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 private use.

Aircraft Design

Introduction to Aircraft Design
Cambridge University Press

The new edition of this popular textbook provides a modern, accessible introduction to the whole process of aircraft design from requirements to conceptual design, manufacture and in-service issues. Highly illustrated descriptions of the full spectrum of aircraft types, their aerodynamics, structures and systems, allow students to appreciate good and poor design and understand how to improve their own designs. Cost data is considerably updated, many new images have been added and new sections are included on the emerging fields of Uninhabited Aerial Vehicles and environmentally-friendly airlines. Examples from real

aircraft projects are presented throughout, demonstrating to students the applications of the theory. Three appendices and a bibliography provide a wealth of information, much not published elsewhere, including simple aerodynamic formulae, an introduction to airworthiness and environmental requirements, aircraft, engine and equipment data, and a case study of the conceptual design of a large airliner.

AIRCRAFT DESIGN

General Aviation Aircraft Design

*Butterworth-
Heinemann*

Find the right answer
the first time with this
useful handbook of

preliminary aircraft design. Written by an engineer with close to 20 years of design experience, *General Aviation Aircraft Design: Applied Methods and Procedures* provides the practicing engineer with a versatile handbook that serves as the first source for finding answers to realistic aircraft design questions. The book is structured in an "equation/derivation/solved example" format for easy access to content. Readers will find it a valuable guide to topics such as sizing of horizontal and vertical tails to minimize drag, sizing of lifting surfaces to ensure proper dynamic stability, numerical performance methods, and common faults and fixes in aircraft design.

In most cases, numerical examples involve actual aircraft specs. Concepts are visually depicted by a number of useful black-and-white figures, photos, and graphs (with full-color images included in the eBook only). Broad and deep in coverage, it is intended for practicing engineers, aerospace engineering students, mathematically astute amateur aircraft designers, and anyone interested in aircraft design. Organized by articles and structured in an "equation/derivation/solved example" format for easy access to the content you need. Numerical examples involve actual aircraft specs. Contains high-interest topics not found in other texts, including sizing of

horizontal and vertical tails to minimize drag, sizing of lifting surfaces to ensure proper dynamic stability, numerical performance methods, and common faults and fixes in aircraft design Provides a unique safety-oriented design checklist based on industry experience Discusses advantages and disadvantages of using computational tools during the design process Features detailed summaries of design options detailing the pros and cons of each aerodynamic solution Includes three case studies showing applications to business jets, general aviation aircraft, and UAVs Numerous high-quality graphics clearly illustrate the book's concepts (note: images

are full-color in eBook only)

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Living in the Future *Design Dimentions Press*

Dan Raymer, noted aircraft designer and author of the industry standard textbook *Aircraft Design: A Conceptual Approach*, has written a non-technical book that will be treasured by

everyone who loves airplanes, wonders how they get designed, and wants to know how somebody becomes an aircraft designer. Half the book is Raymer's warm and personal memoir of growing up in the 50's and 60's as the son of a Navy Test Pilot, discovering his own love of aviation, and entering the rarefied club of those who stare at a blank sheet of paper and turn it into a new aircraft or spacecraft design. The other half covers Raymer's early involvement in the projects that became the B-2, F-22, T-45, F-35, and many more. The book is an "easy" read, quick-paced, funny, and aimed at a general audience. Raymer includes his mistakes, disappointments, and

downright stupid decisions. It's not all airplanes either - read about Raymer's aborted musical career, his misadventures in exotic destinations like Belarus, Turkey, and Bulgaria, how he got on the Internet early enough to grab www.aircraftdesign.com, and how he came to write his design textbook. The book is in paperback and is due out this fall from Design Dimension Press (Los Angeles, CA).

Simplified Aircraft Design for Homebuilders *Design Dimensions Press*

Easy-to-follow, step-by-step methods to lay out, analyse, and optimise your new homebuilt aircraft concept; Industry

methods distilled to the essence, and written in a straight forward, easy-to-read style; No derivations, proofs, or complicated equations. Every step is illustrated with an all-new design example that is followed through from beginning to end.

Aircraft Design

Airplane Design VII
DARcorporation

Aircraft Design / RDS-Student *Amer Inst of Aeronautics &*
This textbook presents the process of aircraft conceptual design as seen in industry aircraft design groups. It contains design methods, illustrations, tips, explanations and equations, and has extensive appendices with key data for

design.

Aircraft Structures

Courier Corporation

This legendary, still-relevant reference text on aircraft stress analysis discusses basic structural theory and the application of the elementary principles of mechanics to the analysis of aircraft structures. 1950 edition.

Aircraft Design Projects *Elsevier*

Written with students of aerospace or aeronautical engineering firmly in mind, this is a practical and wide-ranging book that draws together the various theoretical elements of aircraft design - structures, aerodynamics, propulsion, control and others - and guides the reader in applying

them in practice. Based on a range of detailed real-life aircraft design projects, including military training, commercial and concept aircraft, the experienced UK and US based authors present engineering students with an essential toolkit and reference to support their own project work. All aircraft projects are unique and it is impossible to provide a template for the work involved in the design process. However, with the knowledge of the steps in the initial design process and of previous experience from similar projects, students will be freer to concentrate on the innovative and analytical aspects of their course project. The authors bring a unique combination of perspectives and experience to this text. It reflects both British and American academic practices in teaching aircraft design. Lloyd Jenkinson has taught aircraft design at both Loughborough and Southampton universities in the UK and Jim Marchman has taught both aircraft and spacecraft design at Virginia Tech in the US. * Demonstrates how basic aircraft design processes can be successfully applied in reality * Case studies allow both student and instructor to examine particular design challenges * Covers commercial and successful student design projects, and includes over 200 high quality illustrations

Fundamentals of Aircraft and Airship Design

Amer Inst of Aeronautics &

The aircraft is only a transport mechanism for the payload, and all design decisions must consider payload first. Simply stated, the aircraft is a dust cover. "Fundamentals of Aircraft and Airship Design, Volume 1: Aircraft Design" emphasizes that the science and art of the aircraft design process is a compromise and that there is no right answer; however, there is always a best answer based on existing requirements and available technologies.

Aircraft Design
Cambridge University Press

Aircraft Design explores fixed winged

aircraft design at the conceptual phase of a project. Designing an aircraft is a complex multifaceted process embracing many technical challenges in a multidisciplinary environment. By definition, the topic requires intelligent use of aerodynamic knowledge to configure aircraft geometry suited specifically to the customer's demands. It involves estimating aircraft weight and drag and computing the available thrust from the engine. The methodology shown here includes formal sizing of the aircraft, engine matching, and substantiating performance to comply with the customer's demands and government regulatory standards. Associated

topics include safety issues, environmental issues, material choice, structural layout, understanding flight deck, avionics, and systems (for both civilian and military aircraft). Cost estimation and manufacturing considerations are also discussed. The chapters are arranged to optimize understanding of industrial approaches to aircraft design methodology. Example exercises from the author's industrial experience dealing with a typical aircraft design are included.

**Performance,
Stability, Dynamics,
and Control of
Airplanes** AIAA

**Knowledge-Based
Integrated Aircraft**

Design *Linköping
University Electronic
Press*

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 Linköping University and in industry

Aircraft Conceptual Design Synthesis

John Wiley & Sons Incorporated

Written for aeronautical designers and students, this guide explains the conceptual design synthesis process, laying out the procedure in logical steps. Focusing on the initial synthesis phase of the design, the book provides examples covering many classes of fixed-wing aircraft. Specific chapters address: 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

optimization; and, analysis of conceptual design. Addenda cover: landing gear considerations; longitudinal control and stability surfaces; lateral control and stability surfaces; mass predictions; and, examples of the synthesis procedure. Included is a disk of spreadsheets providing core data. Howe is an aviation consultant. Distributed in the US by ASME. Annotation copyrighted by Book News, Inc., Portland, OR

Introduction to Flight Testing and Applied

Aerodynamics *Amer Inst of Aeronautics &*
An introduction into the art and science of measuring and predicting airplane performance,

""Introduction to Flight Testing and Applied Aerodynamics"" will benefit students, homebuilders, pilots, and engineers in learning how to collect and analyze data relevant to the takeoff, climb, cruise, handling qualities, descent, and landing of an aircraft. This textbook presents a basic and concise analysis of airplane performance, stability, and control. Basic algebra, trigonometry, and some calculus are used. Topics discussed include: Engine and propeller performance; Estimation of drag; Airplane dynamics; Wing spanwise lift distributions; Flight experimentation; Airspeed calibration; Takeoff performance; Climb performance; and, Dynamic and static stability. Special

features: examples containing student-obtained data about specific airplanes and engines; simple experiments that determine an airplane's performance and handling qualities; and, end-of-chapter problems (with answers supplied in an appendix).

Stability and Control of Conventional and Unconventional Aerospace Vehicle Configurations

Springer

This book introduces a stability and control methodology named AeroMech, capable of sizing the primary control effectors of fixed wing subsonic to hypersonic designs of conventional and unconventional configuration layout. Control power

demands are harmonized with static-, dynamic-, and maneuver stability requirements, while taking the six-degree-of-freedom trim state into account. The stability and control analysis solves the static- and dynamic equations of motion combined with non-linear vortex lattice aerodynamics for analysis. The true complexity of addressing subsonic to hypersonic vehicle stability and control during the conceptual design phase is hidden in the objective to develop a generic (vehicle configuration independent) methodology concept. The inclusion of geometrically asymmetric aircraft layouts, in addition to the reasonably well-

known symmetric aircraft types, contributes significantly to the overall technical complexity and level of abstraction. The first three chapters describe the preparatory work invested along with the research strategy devised, thereby placing strong emphasis on systematic and thorough knowledge utilization. The engineering-scientific method itself is derived throughout the second half of the book. This book offers a unique aerospace vehicle configuration independent (generic) methodology and mathematical algorithm. The approach satisfies the initial technical quest: How to develop a

'configuration stability & control' methodology module for an advanced multi-disciplinary aerospace vehicle design synthesis environment that permits consistent aerospace vehicle design evaluations?

Lessons Learned

Airplane Design: Preliminary sizing of airplanes

Darcorporation

Design of Aircraft *Pearson*

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. **KEY TOPICS:** 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. **MARKET:** For professionals in the Aerospace Engineering field.

Basics of R/C Model Aircraft Design
Motorbooks International

A comprehensive guide to designing radio control model airplanes. Andy Lennon

presents a thorough and comprehensive introduction to the intriguing world of model aerodynamics. Whatever your modeling background, this book will be a valuable reference source in your R/C library and will never be outdated. Fully illustrated.

Innovative Design and Development Practices in Aerospace and Automotive Engineering
Springer

The book presents the best articles presented by researchers, academicians and industrial experts in the International Conference on "Innovative Design and Development Practices in Aerospace and Automotive Engineering (I-DAD

2016)". The book discusses new concept designs, analysis and manufacturing technologies, where more swing is for improved performance through specific and/or multifunctional linguistic design aspects to downsize the system, improve weight to strength ratio, fuel efficiency, better operational capability at room and elevated temperatures, reduced wear and tear, NVH aspects while balancing the challenges of beyond Euro IV/Barat Stage IV emission norms, Greenhouse effects and recyclable materials. The innovative methods discussed in the book will serve as a reference material for educational and research organizations,

as well as industry, to take up challenging projects of mutual interest.

Small Unmanned Fixed-wing Aircraft Design *John Wiley & Sons*

Small Unmanned Fixed-wing Aircraft Design is the essential guide to designing, building and testing fixed wing UAVs (or drones). It deals with aircraft from two to 150 kg in weight and is based on the first-hand experiences of the world renowned UAV team at the UK's University of Southampton. The book covers both the practical aspects of designing, manufacturing and flight testing and outlines and the essential calculations needed to underpin

successful designs. It describes the entire process of UAV design from requirements definition to configuration layout and sizing, through preliminary design and analysis using simple panel codes and spreadsheets to full CFD and FEA models and on to detailed design with parametric CAD tools. Its focus is on modest cost approaches that draw heavily on the latest digital design and manufacturing methods, including a strong emphasis on utilizing off-the-shelf components, low cost analysis, automated geometry modelling and 3D printing. It deliberately avoids a deep theoretical coverage of aerodynamics or structural mechanics;

rather it provides a design team with sufficient insights and guidance to get the essentials undertaken more pragmatically. The book contains many all-colour illustrations of the dozens of aircraft built by the authors and their students over the last ten years giving much detailed information on what works best. It is predominantly aimed at under-graduate and MSc level student design and build projects, but will be of interest to anyone engaged in the practical problems of getting quite complex unmanned aircraft flying. It should also appeal to the more sophisticated aero-modeller and those engaged on research based around fixed

wing UAVs.

Introduction to Aircraft Flight Mechanics AIAA

Based on a 15-year successful approach to teaching aircraft flight mechanics at the US Air Force Academy, this text explains the concepts and derivations of equations for aircraft flight mechanics. It covers aircraft performance, static stability, aircraft dynamics stability and feedback control.

Aircraft Design Concepts CRC Press

Aircraft Design Concepts: An Introductory Course on Aircraft Design introduces the principles of aircraft design through a quantitative approach developed over two

decades of teaching aircraft design to 4th-year and graduate students. Building on prerequisite courses, the text develops basic design skills and methodologies, while also explaining the underlying physics. The book uses an historical approach to examine a wide range of aircraft types and their design, and additionally builds an appreciation of the rich history of aeronautical engineering. Numerous charts, photos and illustrations enhance the presentation, which imparts both the technical knowledge and creativity needed for aircraft design.

Unmanned Aircraft Design Morgan & Claypool Publishers

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.

new book develops aircraft performance techniques from first principles and applies then to real airplanes. It also address a philosophy of, and techniques for aircraft design. By developing and discussing these two subjects in a single text, the author captures a degree of synergism not found in other texts. The book is written in a conversational style, a trademark of all of John Anderson's texts, to enhance the readers' understanding.

Trees of Delhi
Penguin Books India

Freedom of Expression in Botswana

Aircraft Performance & Design McGraw-Hill
Science Engineering
Written by one of the most succesful aerospace authors, this

Aerodynamics of a Lifting System in Extreme Ground Effect Springer
Science & Business Media

This book is dedicated to the memory of a distinguished Russian engineer, Rostislav E. Alexeyev, who was the first in the world to develop the largest ground effect machine - Ekranoplan. One of Alexeyev's design concepts with the aerodynamic configuration of a flying wing can be seen on the front page. The book presents a description of a mathematical model of flow past a lifting system, performing steady and unsteady motions in close proximity to the underlying solid surface (ground). This case is interesting for practical purposes because both the aerodynamic and the economic efficiency of the system near the ground are most pronounced. Use of the method of matched asymptotic expansions enables closed form solutions for the aerodynamic characteristics of the wings-in-ground effect. These can be used for design, identification, and processing of experimental data in the course of developing ground effect vehicles. The term extreme ground effect, widely used through out the book, is associated with very small relative ground clearances of the order of 10% or less. The theory of a lifting surface, moving in immediate proximity to the ground, represents one of the few limiting cases that can be treated analytically. The author would like to acknowledge that this work has been

influenced by the ideas of Professor Sheila E. Widnall, who was the first to apply the matched asymptotics techniques to treat lifting flows with the ground effect. Saint Petersburg, Russia February 2000 Kirill V.

Rozhdestvensky
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