

Fundamentals Of Compressible Flow Solution Manual

This book covers different aspects of gas injection, from the classic pressure maintenance operation to enhanced oil recovery (EOR), underground gas storage (UGS), and carbon capture and storage (CCS). The authors detail the unique characteristics and specific criteria of each application, including: material balance equations phase behaviour reservoir engineering well design operating aspects surface facilities environmental issues Examples, data, and simulation codes are provided to enable the reader to gain an in-depth understanding of these applications. Fundamentals and Practical Aspects of Gas Injection will be of use to practising engineers in the fields of reservoir engineering, and enhanced oil recovery. It will also be of interest to researchers, academics, and graduate students working in the field of petroleum engineering.

Provides all necessary equations, tables, and charts as well as self tests.

Included chapters cover reaction propulsion systems and real gas effects. Written and organized in a manner that makes it accessible for self learning.

Compressible Fluid Dynamics (or Gas Dynamics) has a wide range of applications in Mechanical, Aeronautical and Chemical Engineering. It plays a significant role in the design and development of compressors, turbines, missiles,

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rockets and aircrafts. This comprehensive and systematically organized book gives a clear analysis of the fundamental principles of Compressible Fluid Dynamics. It discusses in rich detail such topics as isentropic, Fanno, Rayleigh, simple and generalised one-dimensional flows. Besides, it covers topics such as conservation laws for compressible flow, normal and oblique shock waves, and measurement in compressible flow. Finally, the book concludes with detailed discussions on propulsive devices. The text is amply illustrated with worked-out examples, tables and diagrams to enable the students to comprehend the subject with ease. Intended as a text for undergraduate students of Mechanical, Aeronautical and Chemical Engineering, the book would also be extremely useful for practising engineers.

This revised and updated seventh edition continues to provide the most accessible and readable approach to the study of all the vital topics and issues associated with gas dynamic processes. At every stage, the physics governing the process, its applications and limitations are discussed in detail. With a strong emphasis on the basic concepts and problem-solving skills, this text is suitable for a course on Gas Dynamics/Compressible Flows/High-speed Aerodynamics at both undergraduate and postgraduate levels in aerospace engineering, mechanical engineering, chemical engineering and applied physics. The elegant

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and concise style of the book along with illustrations and worked-out examples makes it eminently suitable for self-study by students and also for scientists and engineers working in the field of gas dynamics in industries and research laboratories. The computer program to calculate the coordinates of contoured nozzle, with the method of characteristics, has been given in C-language. The program listing along with a sample output is given in the Appendix. NEW TO THE EDITION • A new chapter on the 'Power of Compressible Bernoulli Equation' • Extra chapter-end examples in Chapter 5 • Additional exercise problems in Chapters 5, 6, 7, and 8 KEY FEATURES • Concise coverage of the thermodynamic concepts to serve as a revision of the background material • Introduction to measurements in compressible flows and optical flow visualization techniques • Introduction to rarefied gas dynamics and high-temperature gas dynamics • Solutions Manual for instructors containing the complete worked-out solutions to chapter-end problems • In-depth presentation of potential equations for compressible flows, similarity rule and two-dimensional compressible flows • Logical and systematic treatment of fundamental aspects of gas dynamics, waves in the supersonic regime and gas dynamic processes TARGET AUDIENCE • BE/B.Tech (Mechanical Engineering, Aeronautical Engineering) • ME/M.Tech (Thermal Engineering, Aeronautical Engineering)

As our knowledge of MEMS continues to grow, so does The MEMS Handbook. The field has changed so much that this Second Edition is now available in three volumes. Individually, each volume provides focused, authoritative treatment of specific areas of interest. Together, they comprise the most comprehensive collection of MEMS knowledge available, packaged in an attractive slipcase and offered at a substantial savings. This best-selling handbook is now more convenient than ever, and its coverage is unparalleled. The first of three volumes, MEMS: Introduction and Fundamentals covers the theoretical and conceptual underpinnings of the field, emphasizing the physical phenomena that dominate at the micro-scale. It also explores the mechanical properties of MEMS materials, modeling and simulation of MEMS, control theory, and bubble/drop transport in microchannels. Chapters were updated where necessary, and the book also includes two new chapters on microscale hydrodynamics and lattice Boltzmann simulations. This volume builds a strong foundation for further study and work in the MEMS field. MEMS: Introduction and Fundamentals comprises contributions from the foremost experts in their respective specialties from around the world. Acclaimed author and expert Mohamed Gad-el-Hak has again raised the bar to set a new standard for excellence and authority in the fledgling fields of MEMS and nanotechnology.

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Original edition: Munson, Young, and Okiishi in 1990.

Are You Ready to See Fluid Mechanics In Action? This text comes with a free Fluid Mechanics Phenomena CD-ROM that brings fluid mechanics to life! It contains a series of short video segments that illustrate various aspects of real-world fluid mechanics. Many of the segments show how fluid motion is related to familiar devices and everyday experiences. Each segment also clearly indicates the key fluid mechanics topic being demonstrated and provides a description of the content. Throughout the text you'll find a special video icon that will let you know when it is appropriate to view a particular video clip. The numbering system will indicate which clip is relevant to the fluid mechanics concepts and theory under discussion. Also Available: The Student Solutions Manual-Easy-to-use study tool with detailed solutions to Review Problems found at the end of each chapter in the text. Wiley: Creating the Future of Engineering Education

This highly informative book offers a comprehensive overview of the fundamentals of propulsion. The book focuses on foundational topics in propulsion, namely gas dynamics, turbomachinery, and combustion to more complex subjects such as practical design aspects of aircraft engines and thermodynamic aspects and analysis. It also includes pedagogical aspects such as end-of-chapter problems and worked examples to augment learning and self-testing. This book is a useful reference for students in the

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area of mechanical and aerospace engineering. Also, scientists and engineers working in the areas of aerospace propulsion and gas dynamics find this book a valuable addition.

Fundamental Mechanics of Fluids, Fourth Edition addresses the need for an introductory text that focuses on the basics of fluid mechanics—before concentrating on specialized areas such as ideal-fluid flow and boundary-layer theory. Filling that void for both students and professionals working in different branches of engineering, this versatile instructional resource comprises five flexible, self-contained sections: Governing Equations deals with the derivation of the basic conservation laws, flow kinematics, and some basic theorems of fluid mechanics. Ideal-Fluid Flow covers two- and three-dimensional potential flows and surface waves. Viscous Flows of Incompressible Fluids discusses exact solutions, low-Reynolds-number approximations, boundary-layer theory, and buoyancy-driven flows. Compressible Flow of Inviscid Fluids addresses shockwaves as well as one- and multidimensional flows. Methods of Mathematical Analysis summarizes some commonly used analysis techniques. Additional appendices offer a synopsis of vectors, tensors, Fourier series, thermodynamics, and the governing equations in the common coordinate systems. The book identifies the phenomena associated with the various properties of compressible, viscous fluids in unsteady, three-dimensional flow situations. It provides techniques for solving specific types of fluid-flow problems, and it covers the derivation of the basic

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equations governing the laminar flow of Newtonian fluids, first assessing general situations and then shifting focus to more specific scenarios. The author illustrates the process of finding solutions to the governing equations. In the process, he reveals both the mathematical methodology and physical phenomena involved in each category of flow situation, which include ideal, viscous, and compressible fluids. This categorization enables a clear explanation of the different solution methods and the basis for the various physical consequences of fluid properties and flow characteristics. Armed with this new understanding, readers can then apply the appropriate equation results to deal with the particular circumstances of their own work.

Work more effectively and check solutions as you go along with the text! This Student Solutions Manual and Study Guide is designed to accompany Munson, Young and Okishi's Fundamentals of Fluid Mechanics, 5th Edition. This student supplement includes essential points of the text, "Cautions" to alert you to common mistakes, 109 additional example problems with solutions, and complete solutions for the Review Problems. Master fluid mechanics with the #1 text in the field! Effective pedagogy, everyday examples, an outstanding collection of practical problems—these are just a few reasons why Munson, Young, and Okiishi's Fundamentals of Fluid Mechanics is the best-selling fluid mechanics text on the market. In each new edition, the authors have refined their primary goal of helping you develop the skills and confidence you need to master the art of solving fluid mechanics problems. This new Fifth Edition

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includes many new problems, revised and updated examples, new Fluids in the News case study examples, new introductory material about computational fluid dynamics (CFD), and the availability of FlowLab for solving simple CFD problems.

Based on the authors' highly successful text Fundamentals of Fluid Mechanics, A Brief Introduction to Fluid Mechanics, 5th Edition is a streamlined text, covering the basic concepts and principles of fluid mechanics in a modern style. The text clearly presents basic analysis techniques and addresses practical concerns and applications, such as pipe flow, open-channel flow, flow measurement, and drag and lift. Extra problems in every chapter including open-ended problems, problems based on the accompanying videos, laboratory problems, and computer problems emphasize the practical application of principles. More than 100 worked examples provide detailed solutions to a variety of problems.

This textbook presents a modern treatment of fundamentals of heat and mass transfer in the context of all types of multiphase flows with possibility of phase-changes among solid, liquid and vapor. It serves equally as a textbook for undergraduate senior and graduate students in a wide variety of engineering disciplines including mechanical engineering, chemical engineering, material science and engineering, nuclear engineering, biomedical engineering, and environmental engineering. Multiphase Heat Transfer and Flow can also be used to teach contemporary and novel applications of heat and mass transfer. Concepts are reinforced with numerous examples and end-of-

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chapter problems. A solutions manual and PowerPoint presentation are available to instructors. While the book is designed for students, it is also very useful for practicing engineers working in technical areas related to both macro- and micro-scale systems that emphasize multiphase, multicomponent, and non-conventional geometries with coupled heat and mass transfer and phase change, with the possibility of full numerical simulation.

Despite dramatic advances in numerical and experimental methods of fluid mechanics, the fundamentals are still the starting point for solving flow problems. This textbook introduces the major branches of fluid mechanics of incompressible and compressible media, the basic laws governing their flow, and gasdynamics. "Fluid Mechanics" demonstrates how flows can be classified and how specific engineering problems can be identified, formulated and solved, using the methods of applied mathematics. The material is elaborated in special applications sections by more than 200 exercises and separately listed solutions. The final section comprises the Aerodynamics Laboratory, an introduction to experimental methods treating eleven flow experiments. This class-tested textbook offers a unique combination of introduction to the major fundamentals, many exercises, and a detailed description of experiments.

Written by some of the world's most renowned petroleum and environmental engineers, Fundamentals of the Petrophysics of Oil and Gas Reservoirs is the first book to offer the practicing engineer and engineering student these new cutting-edge techniques for

prediction and forecasting in petroleum engineering and environmental management. In this book, the authors combine a rigorous, yet easy to understand, approach to petrophysics and how it is applied to petroleum and environmental engineering to solve multiple problems that the engineer or geologist faces every day. Useful in the prediction of everything from crude oil composition, pore size distribution in reservoir rocks, groundwater contamination, and other types of forecasting, this approach provides engineers and students alike with a convenient guide to many real-world applications. Petroleum geologists and engineers must have a working knowledge of petrophysics in order to find oil reservoirs and devise the best plan for getting it out of the ground, before drilling can begin. This book offers the engineer and geologist a fundamental guide for accomplishing these goals, providing much-needed calculations and formulas on fluid flow, rock properties, and many other topics that are encountered every day. The approach taken in Fundamentals of the Petrophysics of Oil and Gas Reservoirs is unique and has not been addressed until now in book format. Readers now have the ability to review the historic development of relationships and equations to define critical petrophysics attributes, many of which have either never been covered in the literature on petrophysics. Useful for the veteran engineer or scientist and the student alike, this book is a must-have for any geologist, engineer, or student working in the field of upstream petroleum engineering. This groundbreaking new volume includes: How to achieve more efficient oil & gas production for the petroleum engineer and

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petroleum geologist More accurate forecasting for the environmental engineer Real-world examples for the engineering student Valuable new information not available anywhere else

"This book introduces the fundamentals of compressible-fluid motion, or gasdynamics."--Preface.

This complete revision of Applied Process Design for Chemical and Petrochemical Plants, Volume 1 builds upon Ernest E. Ludwig's classic text to further enhance its use as a chemical engineering process design manual of methods and proven fundamentals. This new edition includes important supplemental mechanical and related data, nomographs and charts. Also included within are improved techniques and fundamental methodologies, to guide the engineer in designing process equipment and applying chemical processes to properly detailed equipment. All three volumes of Applied Process Design for Chemical and Petrochemical Plants serve the practicing engineer by providing organized design procedures, details on the equipment suitable for application selection, and charts in readily usable form. Process engineers, designers, and operators will find more chemical petrochemical plant design data in: Volume 2, Third Edition, which covers distillation and packed towers as well as material on azeotropes and ideal/non-ideal systems. Volume 3, Third Edition,

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which covers heat transfer, refrigeration systems, compression surge drums, and mechanical drivers. A. Kayode Coker, is Chairman of Chemical & Process Engineering Technology department at Jubail Industrial College in Saudi Arabia. He's both a chartered scientist and a chartered chemical engineer for more than 15 years. and an author of Fortran Programs for Chemical Process Design, Analysis and Simulation, Gulf Publishing Co., and Modeling of Chemical Kinetics and Reactor Design, Butterworth-Heinemann. Provides improved design manuals for methods and proven fundamentals of process design with related data and charts Covers a complete range of basic day-to-day petrochemical operation topics with new material on significant industry changes since 1995. This book addresses both the fundamentals and the practical industrial applications of Large Eddy Simulation (LES) in order to bridge the gap between LES research and the growing need to use it in engineering modeling. Computational Modelling of Objects Represented in Images: Fundamentals, Methods and Applications III contains all contributions presented at the International Symposium CompIMAGE 2012 - Computational Modelling of Object Presented in Images: Fundamentals, Methods and Applications (Rome, Italy, 5-7 September 2012). The contributions cover the state-o This handbook covers computational fluid dynamics from fundamentals to

applications. This text provides a well documented critical survey of numerical methods for fluid mechanics, and gives a state-of-the-art description of computational fluid mechanics, considering numerical analysis, computer technology, and visualization tools. The chapters in this book are invaluable tools for reaching a deeper understanding of the problems associated with the calculation of fluid motion in various situations: inviscid and viscous, incompressible and compressible, steady and unsteady, laminar and turbulent flows, as well as simple and complex geometries. Each chapter includes a related bibliography

Covers fundamentals and applications
Provides a deeper understanding of the problems associated with the calculation of fluid motion
A comprehensive examination of the fundamentals of compressible flow and gas dynamics.

The sixth editions of these seminal books deliver the most up to date and comprehensive reference yet on the finite element method for all engineers and mathematicians. Renowned for their scope, range and authority, the new editions have been significantly developed in terms of both contents and scope. Each book is now complete in its own right and provides self-contained reference; used together they provide a formidable resource covering the theory and the application of the universally used FEM. Written by the leading professors in their

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fields, the three books cover the basis of the method, its application to solid mechanics and to fluid dynamics. * This is THE classic finite element method set, by two the subject's leading authors * FEM is a constantly developing subject, and any professional or student of engineering involved in understanding the computational modelling of physical systems will inevitably use the techniques in these books * Fully up-to-date; ideal for teaching and reference

A pioneer in the fields of statistics and probability theory, Richard von Mises (1883–1953) made notable advances in boundary-layer-flow theory and airfoil design. This text on compressible flow, unfinished upon his sudden death, was subsequently completed in accordance with his plans, and von Mises' first three chapters were augmented with a survey of the theory of steady plane flow. Suitable as a text for advanced undergraduate and graduate students — as well as a reference for professionals — *Mathematical Theory of Compressible Fluid Flow* examines the fundamentals of high-speed flows, with detailed considerations of general theorems, conservation equations, waves, shocks, and nonisentropic flows. In this, the final work of his distinguished career, von Mises summarizes his extensive knowledge of a central branch of fluid mechanics. Characteristically, he pays particular attention to the basics, both conceptual and mathematical. The novel concept of a specifying equation clarifies the role of

thermodynamics in the mechanics of compressible fluids. The general theory of characteristics receives a remarkably complete and simple treatment, with detailed applications, and the theory of shocks as asymptotic phenomena appears within the context of rational mechanics.

NOTE: The Binder-ready, Loose-leaf version of this text contains the same content as the Bound, Paperback version. Fundamentals of Fluid Mechanic, 8th Edition offers comprehensive topical coverage, with varied examples and problems, application of visual component of fluid mechanics, and strong focus on effective learning. The text enables the gradual development of confidence in problem solving. The authors have designed their presentation to enable the gradual development of reader confidence in problem solving. Each important concept is introduced in easy-to-understand terms before more complicated examples are discussed. Continuing this book's tradition of extensive real-world applications, the 8th edition includes more Fluid in the News case study boxes in each chapter, new problem types, an increased number of real-world photos, and additional videos to augment the text material and help generate student interest in the topic. Example problems have been updated and numerous new photographs, figures, and graphs have been included. In addition, there are more videos designed to aid and enhance comprehension, support visualization skill

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building and engage students more deeply with the material and concepts. The Subject Of Compressible Flow Or Gas Dynamics Deals With The Thermo-Fluid Dynamic Problems Of Gases And Vapours. It Is Now An Important Part Of The Undergraduate And Postgraduate Curricula. Fundamentals Of Compressible Flow Covers This Subject In Fourteen Well Organised Chapters In A Lucid Style. A Large Mass Of Theoretical Material And Equations Has Been Supported By A Number Of Figures And Graphical Depictions. Author'S Sprawling Teaching Experience In This Subject And Allied Areas Is Reflected In The Clarity, And Systematic And Logical Presentation. Salient Features * Begins With Basic Definitions And Formulas. * Separate Chapters On Adiabatic Flow, Isentropic Flow And Rate Equations. * Includes Basics Of The Atmosphere, And Measuring Techniques. Separate Sections On Wind Tunnels, Laser Techniques, Hot Wires And Flow Measurement. * Discusses Applications In Aircraft And Rocket Propulsion, Space Flights, And Pumping Of Natural Gas. * Contains Large Number Of Solved And Unsolved Problems. The Present Edition Has An Additional Chapter (14) On Miscellaneous Problems In Compressible Flow (Gas Dynamics). This Is Designed To Support The Tutorials, Practice Exercises And Examinations. Problems Have Been Specially Chosen For Students And Engineers In The Areas Of Aerospace, Chemical, Gas And Mechanical

Engineering.

Overview White's Fluid Mechanics offers students a clear and comprehensive presentation of the material that demonstrates the progression from physical concepts to engineering applications and helps students quickly see the practical importance of fluid mechanics fundamentals. The wide variety of topics gives instructors many options for their course and is a useful resource to students long after graduation. The book's unique problem-solving approach is presented at the start of the book and carefully integrated in all examples. Students can progress from general ones to those involving design, multiple steps and computer usage. McGraw-Hill Education's Connect, is also available as an optional, add on item. Connect is the only integrated learning system that empowers students by continuously adapting to deliver precisely what they need, when they need it, how they need it, so that class time is more effective. Connect allows the professor to assign homework, quizzes, and tests easily and automatically grades and records the scores of the student's work. Problems are randomized to prevent sharing of answers and may also have a "multi-step solution" which helps move the students' learning along if they experience difficulty. The eighth edition of Fluid Mechanics offers students a clear and comprehensive presentation of the material that demonstrates the progression

from physical concepts to engineering applications. The book helps students to see the practical importance of fluid mechanics fundamentals. The wide variety of topics gives instructors many options for their course and is a useful resource to students long after graduation. The problem-solving approach is presented at the start of the book and carefully integrated in all examples. Students can progress from general examples to those involving design, multiple steps, and computer usage.

Foundations and Applications of Mechanics: Volume II, Fluid Mechanics shows how suitable approximations such as ideal fluid flow model, boundary layer methods, and the acoustic approximation, can help solve problems of practical importance. The author proceeds from the general to the particular, making it clear at each stage what assumptions have been made to obtain a particular approximation. In his discussion of compressible fluids, Jog steers away from using gas tables and emphasizes obtaining solutions by numerical techniques - an approach more amenable to computer solutions. He discusses the control volume and the differential equation forms of governing equations in detail and uses examples to demonstrate the advantages and shortcomings of each approach.

There is a resurgence of applications in which the calculus of variations has

direct relevance. In addition to application to solid mechanics and dynamics, it is now being applied in a variety of numerical methods, numerical grid generation, modern physics, various optimization settings and fluid dynamics. Many applications, such as nonlinear optimal control theory applied to continuous systems, have only recently become tractable computationally, with the advent of advanced algorithms and large computer systems. This book reflects the strong connection between calculus of variations and the applications for which variational methods form the fundamental foundation. The mathematical fundamentals of calculus of variations (at least those necessary to pursue applications) is rather compact and is contained in a single chapter of the book. The majority of the text consists of applications of variational calculus for a variety of fields.

Basic fluid dynamic theory and applications in a single, authoritative reference. The growing capabilities of computational fluid dynamics and the development of laser velocimeters and other new instrumentation have made a thorough understanding of classic fluid theory and laws more critical today than ever before. Fundamentals of Fluid Mechanics is a vital repository of essential information on this crucial subject. It brings together the contributions of recognized experts from around the world to cover all of the concepts of classical

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fluid mechanics—from the basic properties of liquids through thermodynamics, flow theory, and gas dynamics. With answers for the practicing engineer and real-world insights for the student, it includes applications from the mechanical, civil, aerospace, chemical, and other fields. Whether used as a refresher or for first-time learning, Fundamentals of Fluid Mechanics is an important new asset for engineers and students in many different disciplines.

This book offers comprehensive coverage of compressible flow phenomena and their applications, and is intended for undergraduate/graduate students, practicing professionals, and researchers interested in the topic. Thanks to the clear explanations provided of a wide range of basic principles, the equations and formulas presented here can be understood with only a basic grasp of mathematics. The book particularly focuses on shock waves, offering a unique approach to the derivation of shock wave relations from conservation relations in fluids together with a contact surface, slip line or surface; in addition, the thrust of a rocket engine and that of an air-breathing engine are also formulated. Furthermore, the book covers important fundamentals of various aspects of physical fluid dynamics and engineering, including one-dimensional unsteady flows, and two-dimensional flows, in which oblique shock waves and Prandtl-Meyer expansion can be observed.

This book is intended to be a reservoir engineering book for college students, but it is not the usual college textbook. It is a modern and very practical guide offering reservoir

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engineering fundamentals, advanced reservoir related topics, reservoir simulation fundamentals, and problems and case studies from around the world. It offers all this information with guidelines on how to assist these processes with the use of simulation software (software not included). It is designed to aid students and professionals alike in their active and important roles throughout the reservoir life cycle (discovery, delineation, development, production, and abandonment), and in the various phases of the reservoir management process (setting strategy, developing plan, implementing, monitoring, evaluating, and completing).

Dealing with general problems in fluid mechanics, convection diffusion, compressible and incompressible laminar and turbulent flow, shallow water flows and waves, this is the leading text and reference for engineers working with fluid dynamics in fields including aerospace engineering, vehicle design, thermal engineering and many other engineering applications. The new edition is a complete fluids text and reference in its own right. Along with its companion volumes it forms part of the indispensable Finite Element Method series. New material in this edition includes sub-grid scale modelling; artificial compressibility; full new chapters on turbulent flows, free surface flows and porous medium flows; expanded shallow water flows plus long, medium and short waves; and advances in parallel computing. A complete, stand-alone reference on fluid mechanics applications of the FEM for mechanical, aeronautical, automotive, marine, chemical and civil engineers. Extensive new coverage of turbulent flow and free surface

treatments

The last decade has seen a dramatic increase of our abilities to solve numerically the governing equations of fluid mechanics. In design aerodynamics the classical potential-flow methods have been complemented by higher modelling-level methods. Euler solvers, and for special purposes, already Navier-Stokes solvers are in use. The authors of this book have been working on the solution of the Euler equations for quite some time. While the first two of us have worked mainly on algorithmic problems, the third has been concerned off and on with modelling and application problems of Euler methods. When we started to write this book we decided to put our own work at the center of it. This was done because we thought, and we leave this to the reader to decide, that our work has attained over the years enough substance in order to justify a book. The problem which we soon faced, was that the field still is moving at a fast pace, for instance because hyper sonic computation problems became more and more important.

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