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Boundary Value Problems for Transonic Flow

Alexander G. Kuz'min

Boundary Value Problems For Transonic Flow

Thomas Charles Adamson, M. F. Platzer



Boundary Value Problems For Transonic Flow:

Boundary Value Problems for Transonic Flow Alexander G Kuz'min, 2003-02-28 Transonic flow occurs around moving objects as they approach and cross the sound barrier Serious problems can occur at this point such as shock induced flow separation which can cause the aircraft to spin out of control Another important practical problem is the achievement of higher aerodynamic performance of aircraft at cruise conditions which leads to considerable fuel savings The success in application of numerical methods for simulation of transonic flow and aircraft design depends on developments in the underlying mathematical theory This book presents a breakthrough in the solvability analysis of boundary value problems which makes it possible to establish convergence of finite element approximations for shock free flow and to provide a framework for putting the existing numerical methods on a more sound basis Also physical aspects concerned with patterns of formation and propagation of weak shock waves are analysed This contributes to the understanding of the extreme sensitivity of transonic flow to perturbation of freestream conditions The developed theoretical knowledge base yields promising concepts of the airfoil design and active flow control by airfoil wing shape modifications or suction blowing through a perforated surface **Boundary Value Problems for Transonic Flow** Focuses on Computational Fluid Dynamics Addresses practical problems such as airfoil design and flow control Presents developments made in the last two decades In essence this is a much needed monograph for researchers and engineers in applied mathematics and numerical analysis applied to aerodynamics and for algorithm developers in Computational Fluid Dynamics in the aircraft industry It gives design engineers the underlying mathematical theory necessary for developing new concepts for airfoil wing design and flow control **A Well Posed Boundary Value Problem in Transonic Gas Dynamics (Classic Reprint)** Jose M.

Sanz, 2017-11-02 Excerpt from **A Well Posed Boundary Value Problem in Transonic Gas Dynamics** The problem of calculating continuous transonic flow past such an airfoil was shown by C Morawetz 20 to be not well posed Motivated by the method of complex characteristics a transonic boundary value problem was developed in 9 for a certain domain obtained by analytic extension to complex values of the independent variables Complex conjugate characteristic coordinates E and n were introduced In these coordinates the stream function is real in the subsonic domain but complex otherwise The new boundary value problem is set by prescribing the real part of ϕ on the boundary of the unit circle This problem has as yet not been shown to be well posed although its numerical solution was found successfully Our contribution will be to show that a corresponding problem for the Tricomi equation is well posed About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books Find more at www.forgottenbooks.com This book is a reproduction of an important historical work Forgotten Books uses state of the art technology to digitally reconstruct the work preserving the original format whilst repairing imperfections present in the aged copy In rare cases an imperfection in the original such as a blemish or missing page may be replicated in our edition We do however repair the vast majority of imperfections successfully any imperfections

that remain are intentionally left to preserve the state of such historical works

Applications to the Theory of Plane Transonic Flow A. R. Manwell, 1979
Landahl, 2019-04-17 This classic monograph on unsteady transonic flow the flow of air encountered at speeds at or near the speed of sound is of continuing interest to students and professionals in aerodynamics fluid dynamics and other areas of applied mathematics After a brief Introduction Swedish physicist Mårten T Landahl presents a chapter in which the two dimensional solution is derived succeeded by a discussion of its relation to the subsonic and supersonic solutions Three chapters on low aspect ratio configurations follow covering triangular wings and similar planforms with curved leading edges rectangular wings and cropped delta wings and low aspect ratio wing body combinations The treatment concludes with a consideration of the experimental determination of air forces on oscillating wings at transonic speeds

The Tricomi Equation with Unsteady Transonic Flow Mårten T. Landahl, 2019-04-17

Transonic Flow Problems in Turbomachinery Thomas Charles Adamson, M. F. Platzer, 1977

Nonlinear Equations of Mixed Type and Transonic Flows Eun A. Chong, 2014 We study a small perturbation problem for the nonexistence of shock free flows We prove uniqueness theorems for the Tricomi equation with the conormal and oblique derivative boundary conditions in Tricomi and Frankl domains To solve boundary value problems for mixed type equations we use the method developed by Morawetz which relies on the hodograph transformation When we consider the TSD equation in the physical plane a flow past airfoil problem gives us a conormal boundary value problem on a Frankl domain for the Tricomi equation A perturbation problem for supersonic patches behind triple points leads to an oblique derivative boundary value problem for the TSD equation

An Annotated Bibliography on Transonic Flow Theory Perry A. Newman, Dennis O. Allison, 1971

Report United States. National Advisory Committee for Aeronautics, 1952

Scientific and Technical Aerospace Reports, 1979

Numerical Computation of Transonic Flows by Finite-element and Finite-difference Methods United States. National Aeronautics and Space Administration. Scientific and Technical Information Office, M. M. Hafez, 1978

Numerical Computation of Transonic Flows by Finite-element and Finite-difference Methods United States. National Aeronautics and Space Administration. Scientific and Technical Information Office, 1978

The Shock and Vibration Digest, 1975

Applied Mechanics Reviews, 1979

U.S. Government Research & Development Reports, 1970

Transonic Aerodynamics L. Pamela Cook, 1993-01-01 This volume offers exciting results perspectives and case studies for the treatment of problems arising in transonic aerodynamics New advances including triple deck theory analysis of stagnation at the nose of a body transonic choked flow and the transonic area rule are presented Interest in analyzing the transonic range of flight its stability properties and especially the question of designing reduced drag shockless or weak shock airfoils keeps growing Present day commercial aircraft cruise in the transonic range Mechanical and aeronautical engineers interested in compressible fluid flows design of optimal wings and an understanding of transonic flow held about wings and airfoils will find the book invaluable This book is understandable to those with a knowledge of continuum mechanics fluids and

asymptotic methods It is appropriate for graduate courses in aerodynamics and mathematical methods **Technical Information Pilot** ,1949 **Bibliography of Scientific and Industrial Reports** ,1967-05 **Functional Differential Systems and Related Topics** Michał Kisielewicz,1980 **AIAA 86-0300 - AIAA 86-0340** ,1986 **Small Disturbance Transonic Flows about Oscillating Airfoils** R. M. Traci,E. D. Albano,J. L Farr (Jr.),H. K. Cheng,1974 A theory and numerical solution method are presented for the problem of two dimensional unsteady transonic flow about thin airfoils undergoing harmonic oscillation The theory is based on a treatment of the unsteady flow as a small perturbation on the non linear steady flow The governing equations for the steady and unsteady perturbation potentials are of mixed elliptic hyperbolic type and are solved by the mixed differencing line relaxation technique of Murman and Cole Detailed steady and unsteady calculations are performed and compared when possible to available experimental data The solution procedure is found to be highly efficient and promises further improvements in efficiency through the use of extrapolation schemes Also the method can be generalized in a straightforward manner to perform calculations with supersonic freestreams and three dimensional finite wing calculations Author

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