

Hypersonics, Volume II

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Hypersonics Volume 1 Defining The Hypersonic Environment

Ernst Heinrich Hirschel



Hypersonics Volume 1 Defining The Hypersonic Environment:

Hypersonics BERTIN,GLOWINSKI,PERIAUX,2012-11-28 The task of defining the aerothermodynamic environment for a vehicle flying through the air at hypersonic speeds offers diverse challenges to the designer He must integrate a wide variety of scientific and technical disciplines blending mathematical modeling computational methods and experimental measurements Many of the manned reentry vehicles are relatively blunt or fly at very high angles of attack so that the drag is relatively large and enter the atmosphere at a relatively low entry angle As a result the hypersonic deceleration occurs at very high altitudes Because the conversion of kinetic energy to internal energy modes occurs in a low density environment the flow field chemistry is an important consideration Experiments on the U S Space Shuttle demonstrated the importance of nonequilibrium flow and surface catalyticity on the heating to the vehicle To determine the aerothermodynamic environment of other vehicles operating hypersonically at very high altitudes e g the Aero Assisted Space Transfer Vehicle the designer may have to consider viscous inviscid interactions and the modeling of noncontinuum flows Configurations that have a relatively high ballistic coefficient such as slender reentry vehicles and reenter the atmosphere at relatively high angles of attack experience severe heating rates and high dynamic pressures but only for a short period of time For these vehicles continuum flow models incorporating equilibrium chemistry are reasonable

Advances in Hypersonics

BALLMAN,BERTIN,PERIAUX,2012-12-06 These three volumes entitled *Advances in Hypersonics* contain the Proceedings of the Second and Third Joint US Europe Short Course in Hypersonics which took place in Colorado Springs and Aachen The Second Course was organized at the US Air Force Academy USA in January 1989 and the Third Course at Aachen Germany in October 1990 The main idea of these Courses was to present to chemists computer scientists engineers experimentalists mathematicians and physicists state of the art lectures in scientific and technical disciplines including mathematical modeling computational methods and experimental measurements necessary to define the aerothermodynamic environments for space vehicles such as the US Orbiter or the European Hermes flying at hypersonic speeds The subjects can be grouped into the following areas Physical environments configuration requirements propulsion systems including airbreathing systems experimental methods for external and internal flow theoretical and numerical methods Since hypersonic flight requires highly integrated systems the Short Courses not only aimed to give in depth analysis of hypersonic research and technology but also tried to broaden the view of attendees to give them the ability to understand the complex problem of hypersonic flight Most of the participants in the Short Courses prepared a document based on their presentation for reproduction in the three volumes Some authors spent considerable time and energy going well beyond their oral presentation to provide a quality assessment of the state of the art in their area of expertise as of 1989 and 1991

Advances in Hypersonics BALLMAN,BERTIN,PERIAUX,1992-05-01 These three volumes entitled *Advances in Hypersonics* contain the Proceedings of the Second and Third Joint US Europe Short Course in Hypersonics which took place

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Hypersonics Bertin, 1989-01-01 *Basics of Aerothermodynamics* Ernst Heinrich Hirschel, 2006-01-16 The last two decades have brought two important developments for aerothermodynamics One is that airbreathing hypersonic flight became the topic of technology programmes and extended system studies The other is the emergence and maturing of the discrete numerical methods of aerodynamics aerothermodynamics complementary to the ground simulation facilities with the parallel enormous growth of computer power Airbreathing hypersonic flight vehicles are in contrast to aeroassisted re entry vehicles drag sensitive They have further highly integrated lift and propulsion systems This means that viscous effects like boundary layer development laminar turbulent transition to a certain degree also strong interaction phenomena are much more important for such vehicles than for re entry vehicles This holds also for the thermal state of the surface and thermal surface effects concerning viscous and thermochemical phenomena more important for re entry vehicles at and near the wall The discrete numerical methods of aerodynamics aerothermodynamics permit now what was twenty years ago not imaginable the simulation of high speed flows past real flight vehicle configurations with thermochemical and viscous effects the description of the latter being still handicapped by insufficient flow physics models The benefits of numerical simulation for flight vehicle design are enormous much improved aerodynamic shape definition and optimization provision of accurate and reliable aerodynamic data and highly accurate determination of thermal and mechanical loads Truly multidisciplinary design and optimization methods regarding the layout of thermal protection systems all kinds of aeroservoelasticity problems of the airframe et cetera begin now to emerge

Advances in Hypersonics Bertin, Ballmann, Periaux, 2012-12-06 These three volumes entitled *Advances in Hypersonics* contain the Proceedings of the Second and Third Joint US Europe Short Course in Hypersonics which took place in Colorado Springs and Aachen The Second Course was organized at the US

Air Force Academy USA in January 1989 and the Third Course at Aachen Germany in October 1990 The main idea of these Courses was to present to chemists computer scientists engineers experimentalists mathematicians and physicists state of the art lectures in scientific and technical disciplines including mathematical modeling computational methods and experimental measurements necessary to define the aerothermodynamic environments for space vehicles such as the US Orbiter or the European Hermes flying at hypersonic speeds The subjects can be grouped into the following areas Physical environments configuration requirements propulsion systems including airbreathing systems experimental methods for external and internal flow theoretical and numerical methods Since hypersonic flight requires highly integrated systems the Short Courses not only aimed to give in depth analysis of hypersonic research and technology but also tried to broaden the view of attendees to give them the ability to understand the complex problem of hypersonic flight Most of the participants in the Short Courses prepared a document based on their presentation for reproduction in the three volumes Some authors spent considerable time and energy going well beyond their oral presentation to provide a quality assessment of the state of the art in their area of expertise as of 1989 and 1991

NASA's Contributions to Aeronautics: Aerodynamics, structures, propulsion, controls, 2010 Two volume collection of case studies on aspects of NACA NASA research by noted engineers airmen historians museum curators journalists and independent scholars Explores various aspects of how NACA NASA research took aeronautics from the subsonic to the hypersonic era publisher description

Hypersonic Aerothermodynamics John J. Bertin, 1994 A modern treatment of hypersonic aerothermodynamics for students engineers scientists and program managers involved in the study and application of hypersonic flight It assumes an understanding of the basic principles of fluid mechanics thermodynamics compressible flow and heat transfer Ten chapters address general characterization of hypersonic flows basic equations of motion defining the aerothermodynamic environment experimental measurements of hypersonic flows stagnation region flowfield the pressure distribution the boundary layer and convective heat transfer aerodynamic forces and moments viscous interactions and aerothermodynamics and design considerations Includes sample exercises and homework problems Annotation copyright by Book News Inc Portland OR

Nonlinear Functional Analysis and its Applications E. Zeidler, 2013-12-01 The main concern in all scientific work must be the human being himself This one should never forget among all those diagrams and equations Albert Einstein This volume is part of a comprehensive presentation of nonlinear functional analysis the basic content of which has been outlined in the Preface of Part I A Table of Contents for all five volumes may also be found in Part I The Part IV and the following Part V contain applications to mathematical present physics Our goals are the following i A detailed motivation of the basic equations in important disciplines of theoretical physics ii A discussion of particular problems which have played a significant role in the development of physics and through which important mathematical and physical insight may be gained iii A combination of classical and modern ideas iv An attempt to build a bridge between the language and thoughts of physicists and

mathematicians We shall always try to advance as soon as possible to the heart of the problem under consideration and to concentrate on the basic ideas

Selected Aerothermodynamic Design Problems of Hypersonic Flight Vehicles

Ernst Heinrich Hirschel, Claus Weiland, 2009-11-26 In this book selected aerothermodynamic design problems in hypersonic vehicles are treated Where applicable it emphasizes the fact that outer surfaces of hypersonic vehicles primarily are radiation cooled an interdisciplinary topic with many implications International Aerospace Abstracts, 1998 Columbia Accident Investigation Board: (vol. 5 issued in 3 parts: appendices G.1-G.9; G.10-G.12; G.13). Vol. 1 dated August 2003; Vols. 2-6 dated October 2003 United States. Columbia Accident Investigation Board, 2003 *Aerodynamics for Engineers* John J. Bertin, Russell M. Cummings, 2021-08-12 Now reissued by Cambridge University Press this sixth edition covers the fundamentals of aerodynamics using clear explanations and real world examples Aerodynamics concept boxes throughout showcase real world applications chapter objectives provide readers with a better understanding of the goal of each chapter and highlight the key take home concepts and example problems aid understanding of how to apply core concepts Coverage also includes the importance of aerodynamics to aircraft performance applications of potential flow theory to aerodynamics high lift military airfoils subsonic compressible transformations and the distinguishing characteristics of hypersonic flow Supported online by a solutions manual for instructors MATLAB files for example problems and lecture slides for most chapters this is an ideal textbook for undergraduates taking introductory courses in aerodynamics and for graduates taking preparatory courses in aerodynamics before progressing to more advanced study *Advanced Hypersonic Test Facilities* Frank K. Lu, 2002 **Columbia Accident Investigation Board Report** United States. Columbia Accident Investigation Board, 2003 Vols 2-6 of the CAIB's Final Report contain appendices that provide the supporting documentation for the main text of the Final Report contained in Vol 1 which was released on Aug 26 2003 These appendix materials were working documents They contain a number of conclusions and proposed recommendations several of which were adopted by the CAIB in Vol 1 The other conclusions and proposed recommendations drawn in Vols 2-6 do not necessarily reflect the views of the CAIB but are included for the record When there is conflict Vol 1 takes precedence It alone is the CAIB's official statement

Hypersonic Flows for Reentry Problems Jean-Antoine Desideri, Roland Glowinski, Jacques Periaux, 2012-12-06 This entry describes the experimental work conducted in the Department of Aeronautics at Imperial College in connection with Test Problems 1 and 2 of the Workshop on Hypersonic Flows for Reentry Problems Part I These are defined as follows Test Problem 1 Flow Over a Slender Cone Test Problem 2 Turbulent Base Flow The main requirement of this text is to present the experimental data for direct comparison with the predictions of CFD codes We have therefore concentrated mainly on a factual statement of measuring techniques and results together with an assessment of experimental accuracy Future publications will be devoted to more extensive physical interpretations and discussions of the results We have produced a large volume of data some of which were categorised as MANDATORY and some as OPTIONAL for the purposes of CFD

validation However only the MANDATORY data are presented here although the other data are available and will be published separately later

2 EXPERIMENTAL ARRANGEMENT

2.1 The Test Facility

The experiments were conducted in the Imperial College No. 2 Gun tunnel. This facility is a conventional intermittent blowdown tunnel with a contoured Mach 9 nominal axisymmetric nozzle fed by a free piston compression heater. The operating condition under which the data contained in this report were obtained is presented in Table 1.

Test 2 T oK M b Mlm Po N m Re m T oK IX IX Case IX w 1 1 7 7 0 14 9 16 6 67x10 5 5x10 59

Aeronautical Engineering, 1992. A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in Scientific and technical aerospace reports STAR and International aerospace abstracts IAA

Engineering Turbulence Modelling and Experiments - 2

F. Martelli, W. Rodi, 2014-06-28. Today understanding turbulence is one of the key issues in tackling flow problems in engineering. Powerful computers and numerical methods are now available for solving flow equations but the simulation of turbulence effects which are nearly always important in practice are still at an early stage of development. Successful simulation of turbulence requires the understanding of the complex physical phenomena involved and suitable models for describing the turbulence momentum heat and mass transfer. The 89 papers including 5 invited papers in this volume present and discuss new developments in the area of turbulence modelling and measurements with particular emphasis on engineering related problems. The high standard of the contributions on the developing and testing of turbulent models attests to the world wide interest this domain is currently attracting from researchers

NASA SP. ,1962

New Technical Books New York Public Library, 1990

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